AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

VOL. 9, No. 40. WEEKLY. | NEW YORK, OCTOBER 2, 1886. | $2.50 per Annum. SINGLE COPIES, 5 CENTS.

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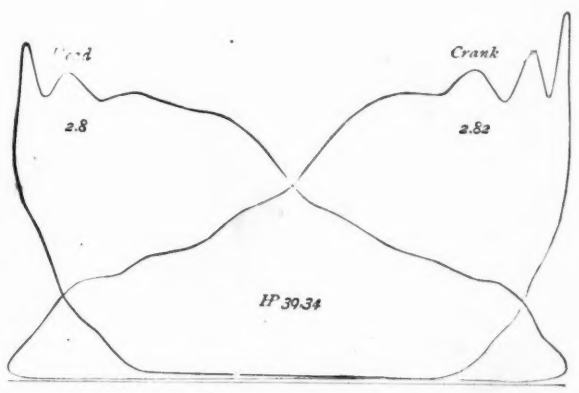
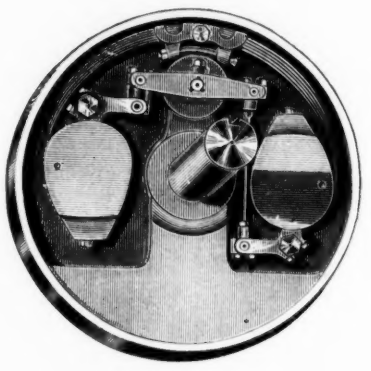
The Rice Automatic Engine.

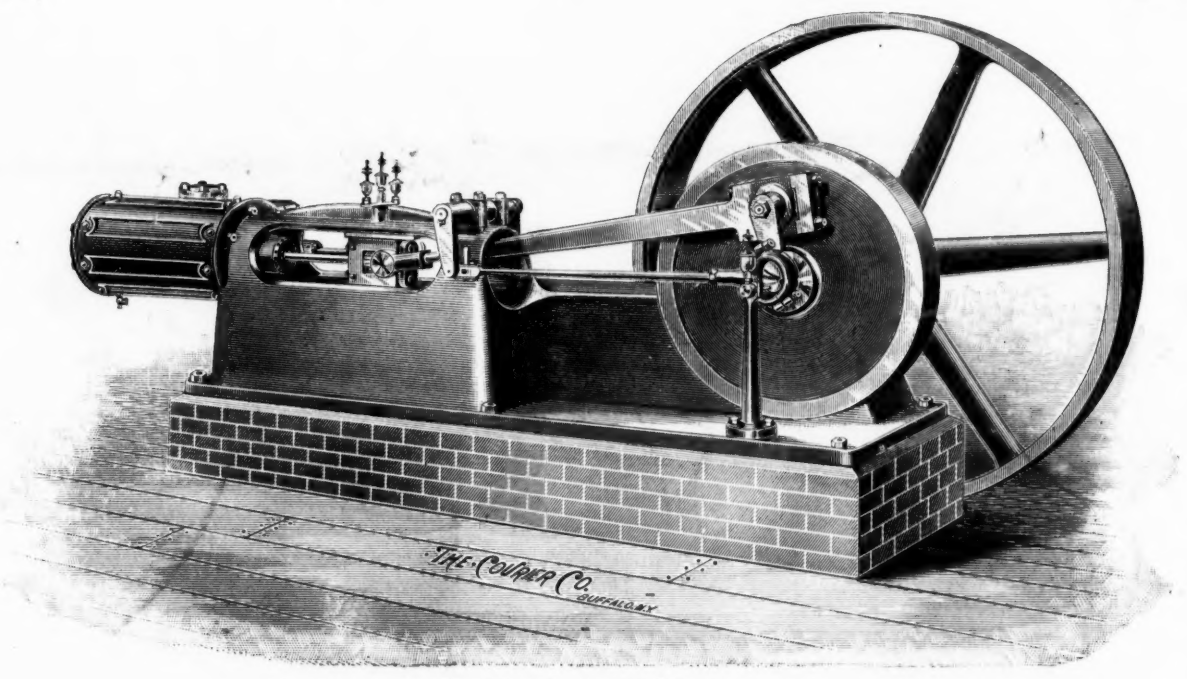
We illustrate herewith this engine, which has been under practical working test for some time, several of them having been built by the patentee, F. B. Rice. During this time its performance has been so satisfactory that the John T. Noye Manufacturing Company, Buffalo, N. Y., has taken it up, and will push its manufacture. The builders claim it to be the first of what is destined to be a prominent and popular class or type of engine; that is, the self-contained straight shaft or side-crank class.

In designing this engine, it has, as will be seen, been divested of many parts that are often used, more, it is claimed, from force of habit than from necessity. The result is a simple and somewhat novel engine.

The bed-plate or frame is a modified form of the Porter-Allen type. It has cylindrical slides, and is extended outward from the main journal to carry the outer bearing, both being embraced in one casting. As there are no eccentrics or other gear on the main shaft, there is no break or gap between the bearings, the shaft being entirely enclosed and hidden from view. The cap castings are prolonged for this purpose, as well as to shut out dust. The liners for the shaft bearings and for crank-pin boxes are cast in moulds specially made. They are, of course, duplicates, and sure to fit. The top and bottom of both main and outer bearings being exactly alike, can be shifted until the entire set is worn out before renewing.







THE RICE AUTOMATIC ENGINE.

The automatic governor is quite simple in construction. Its position in the back of crank disk removes it from sight and danger from outside sources. It is connected to the eccentric by a closely-fitted pin, passing through the main crank-pin center. The use of all locks, cams and wedges is avoided, the chief design of the governor being to avoid friction. The duties of the governor are also materially lessened by the use of a practically balanced slide valve. This valve can easily be moved under full head of steam by one hand grasping the smooth valve stem. The valve takes steam internally, and exhausts at the ends, thus leaving the valve-chest and stuffing-box free from pressure, except that of exhaust. This is a convenient arrangement in fitting the valve and for examination, as the engine or valve can be operated with the chest cover removed and the valve in full view. The valve is of the double-effect class, and, judging by the diagram, is very effective. The diagram shown was taken February 11th from an engine in Buffalo. The spring used was forty, which is rather light for the revolutions—260 per minute. The engine is 8"x16". A Thompson indicator was used. Steam, 68 lbs.; exhaust pressure in receiver, 1 lb., the exhaust being used to warm the building. Indicated horse-power, 39.34.

The advantages of the application of the automatic cut-off to small engines have been frequently denied; but it is claimed by the builders of this engine that as high as fifty per cent. has been saved by it over throttling engines it has displaced, and that cards showing water consumption as low as 22 lbs. per hour per horse-power have been taken from a 5x10 engine.

All parts of this engine can be oiled without stopping. The oil cup shown on the post in front of crank drops oil into the interior of the eccentric, which is flanged to retain it. From there it is forced to the crank-pin by centrifugal force, a portion finding its way to the eccentric strap, and also oiling the governor rock-shaft in the crank-pin.

The rock shaft for valve connection is neatly mounted over the slide, where it is perfectly accessible; in fact, the whole design of the engine leaves the working parts outside in plain view and convenient for adjusting and cleaning.

The reciprocating parts are of such weight that a pressure of 35 pounds per inch is required on the piston to stop and start them at regular speed of the engine. This, together with liberal wearing surfaces, ground steel bearings, and anti-friction liners, gives the engine smooth and cool running qualities. One filling of the crank-pin oiler is said to last a week with a 40 horse-power engine. The engine is carefully counterbalanced against shaking; one of them we are told was run for some weeks set on wooden horses 20" above the floor.

The bed-plate has ample strength entirely independent of foundation. It has a large rectangular base provided around its outer edge with a rib which retains all drippings.

One of the most attractive exhibits at the Minneapolis Exposition is a 40 horse-power engine shown by the J. T. Noye Company, and in charge of Mr. J. A. Hutchinson. It is driving the Edison light, and the electricians have placed six lamps inside the fly-wheel, making quite a curious and novel display.

The extraordinary claim is made for this engine that it will govern within one-third of one per cent. with load varying from nothing to full rated power.

A manufacturers' association has been started in Atlanta for the purpose of fostering the manufacturing interest and inviting new plants. It is proposed to have handsome rooms, where manufacturers and their friends can meet, and where parties seeking a location can be entertained and informed as to Atlanta's advantages.

How Some Folks Make Patterns.

BY F. W. BARROWS.

There are about as many different ideas in regard to the construction of any one pattern, and there may be several good ways of making the pattern. Where is the pattern maker who, in looking over patterns he knew were made "outside," has not noticed that "they don't do their work as we do"? This only shows that your way is not the only way, and very likely not the best way of doing the particular job under inspection.

Now, as a pattern is only a "means towards an end," which end is not always in the foundry, although a good many patterns are here brought to an early and untimely end, we should not consider the pattern of more importance than the end for which the pattern is made. This is sometimes the case with those who think that the moulder is simply a machine, which, if supplied with any kind of a pattern, is bound to turn out a good casting. Moulders have some ideas in regard to moulding patterns, which the pattern-maker should respect; and if he would try to construct the pattern so that it would mould according to the moulder's ideas of right, I think that all hands would be better pleased with the result. The great idea is to get a nice casting, and where the pattern-maker and moulder work in harmony this is usually accomplished.

The pattern maker certainly has the right to criticise his own work, and perhaps the work of any of his fellow craftsmen; but let his criticisms stick to hard facts, and not be based on prejudice, as I am afraid is apt to be the case. I have noticed, and so have you, I presume, that when some outside pattern has found its way to our shop, how many faults we seem to see in it. Perhaps the whole gang will get after it in this style: There is a pattern, which Overtheway & Co. have made, and it has been sent to our shop to mould, and has found its way to the pattern maker. If it is a new pattern, any of the help can see that it is a stranger, as soon as they set eyes on it; then see how it will be criticised. Perhaps away down in our minds we can see that it is a neater-looking, better constructed job than we ever made, or could make; still let us see if we can't find some fault in it.

Yes, there it is, "see that short grain."

"How long do you suppose that will stand in the sand? They hadn't ought to put that short grain there."

There was really no way to avoid the short grain, in this case, perhaps, but that makes no difference, we set out to find some weak spot in this pattern, and we are bound to do it,

and as long as no one has the courage to speak for Overtheway & Co., their reputation as first-class workmen will suffer in the judgment, or more correctly, in the conversation of present company.

"Here's another thing, a 2″ core print that just fits the box.

"We always make the print a little large because you know the core will swell a little in baking, at least, that 10″ cylinder pattern I made I left the core print a little full, and the moulder said it was all right, and of course a 2″ print will swell the same in proportion to its size."

Yes, that is the reason that none of your small work ever has the holes cored out in just the right spot. The core will always go to the top of the print and perhaps it will twist over one side a little. You have always laid the blame on the moulder's shoulders, when by a little experiment you would have found that a 2″ core would, if the sand wasn't too rich, just fit the box after baking, and consequently a print just the size of the box would be just right for the core. But as we are bound to condemn this pattern don't let us say anything about this.

"Look at those fillets, just a three-cornered piece which cuts off the angle of 90° but leaves two in its place of 135° each. This, anyone (of the present company) can see is bad practice, because what is a fillet good for if it doesn't do away with angles?" As for me, I would rather see this kind of a fillet or corner, put in neatly (as in the present case) than to see some of the fillets that pretend to be a quarter circle more or less, but are in reality no nearer the ideal fillet in shape than is the present specimen.

Now, see here, what is a fillet used for?

"To strengthen the casting or to prevent shrinkage in a place that would weaken the casting or look bad, and it may be used to make the moulder happy, if you think he deserves it."

Correct; and doesn't the present specimen fill all of these conditions? There is really only one fault about it. It isn't a quarter circle, but see how much easier it can be made and put in than a regular fillet—no feather edges to break off—and after it is in place there will be no edges to roll up. In short, it is really better, so far as durability goes, and just as good in every other particular, except, perhaps, in regard to looks, and this, very likely, is only a cultivated taste, like smoking, for instance. I presume that the casting will be just as strong as though the fillets were all perfect arcs.

"And now here is one more thing. See this chalk-mark 2? That means two castings wanted from this pattern. See how cheap we have sold ourselves? Here is a pattern that we haven't been able to find any really serious fault in, even though our criticism was founded on prejudice, and was all on the supposition that this pattern was intended for a first-class job, and here is the proof that it was made for two castings only. We shall have more respect for Overtheway's work after this.

Now be honest, and own up that this criticism, or rather fault-finding, we have been indulging in was nothing but prejudice. This is very apt to be the case with all criticism. We condemn others' ways of doing work only because they are different from our own, when in many cases our way is the one that would be condemned by a fair judge.

If you wish to be at the head of your trade, strive to adopt all the best ideas. If your own work won't bear comparison with Overtheway's, why, condemn your own and try to improve on their ways.

If you are so short-sighted as to stick to your own way, after you have found that it isn't the best way, or are so bigoted that you can't see any faults in your own work, and be willing to admit that there are faults, I am pretty sure that you will be left far behind in the race.

Modern Locomotive Construction.

By J. G. A. Meyer.

Twenty-Seventh Paper.

In the eleventh paper we have seen that, when a direct connection is made between the eccentric and valve (that is when no rocker is employed) as shown in Fig. 163, the eccentric will always travel ahead of the crank. Consequently, if, as in Fig. 163, the crank pin occupies the position A as shown, and is to rotate in the direction as indicated by the arrow marked 1, then the position of the eccentric will be the same as that which is shown in full lines and whose center is at B. If, on the other hand, the crank-pin occupies the position A as before, but is to rotate in the direction indicated by the arrow 2, then the position of the eccentric must be equal to the linear advance of the slide valve. Referring now to Fig. 163 it must readily be perceived that when the engine is to turn in the direction as indicated by arrow 1, then the eccentric drawn in full lines, and whose center is at B, and that alone, must move the slide valve; and when the engine is to rotate in the opposite direction, as indicated by the arrow 2, then the eccentric drawn in dotted lines (and not the other one) must move the slide valve. From the foregoing we conclude that in order to reverse the engine we must disengage one eccentric and engage the other, and for this purpose the link, as shown in Figs. 164 and 165, is employed. In Fig. 164 we see that one end of each eccentric rod is attached to the link. In this link a slot or opening D D is cut lengthwise in which a block E, called the link block, can freely but accurately move from one end to the other end of the link. The

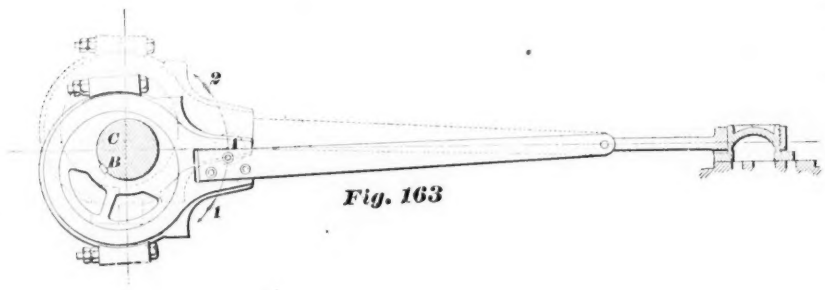


Fig. 163

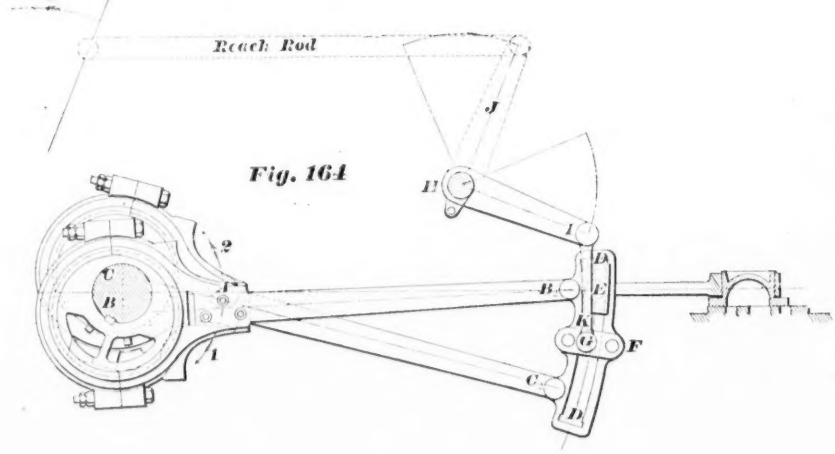


Fig. 164

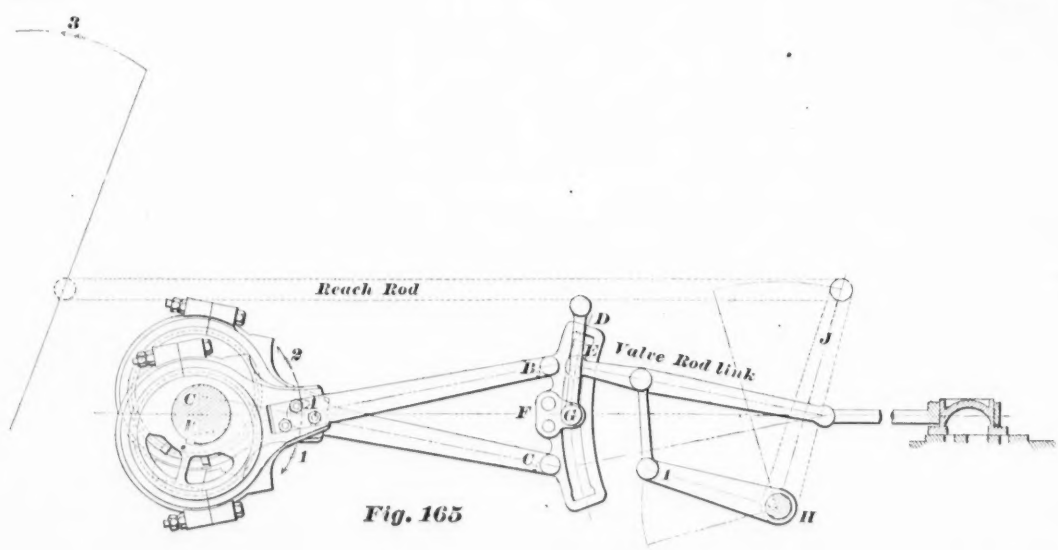


Fig. 165

There are two methods of applying the link. First, it may be applied as shown in Fig. 164. In this case, if we move the reverse lever, we also move the link, and not the block, and thus set the link to any desired position. Of course, in moving the link, the end of the eccentric rods, which are attached to the link, are carried with it. Links which are moved by the reversing lever, so as to reverse the motion of the engine, are called "shifting links."

The second method of applying the link is illustrated in Fig. 165. Here the reversing lever moves the valve rod link to which the link block is attached, but does not move the link; or, in short, we may say that, in order to reverse the motion of the engine, the link block is shifted in the link. In this case the link is called a "stationary link."

By the term "stationary" is simply meant that the link is suspended from a stationary or fixed point; the link itself is not stationary, because, when the engine is running, either one or the other eccentric, or both, will act upon the link, and thus keep it continually on the move.

It will readily be seen by referring to Fig. 164 that when a shifting link is used, and the engine is to rotate in the direction indicated by arrow 1, then the link must occupy the position as here shown; that is, it must have been moved downwards until the eccentric rod pin B_2 and the center of the link block E will lie in the same straight horizontal line. If the engine is to rotate in an opposite direction, then the link must be lifted up until the center of eccentric rod pin C_2 and the center of the link block will be in the same straight horizontal line.

Now, referring to Fig. 165, we see that when the stationary link is used, and the engine is to rotate in the direction as indicated by arrow 1, the link block, not the link, must be moved upwards until its center and the center of the eccentric rod pin B_2 lie in a horizontal line, as here shown, and, when the engine is to move in an opposite direction, then the link block must be moved downwards until its center and the center of the eccentric rod pin C_2 is in line. It may also be of interest to the reader to note some of the differences in the construction of the shifting and that of the stationary links. In the former the curvature of the link is towards the axle; that is, the center from which the link has been drawn is located towards the axle. On the other hand, the center from which the stationary link is drawn is located towards the slide valve. Again, notice that in the shifting link the eccentric rods are coupled to the concave side of the link, and in the stationary link the eccentric rods are coupled to the convex side of the link. It can also be shown that when the latter link is used the lead of the slide valve will be constant at whatever point of the stroke steam may be cut off, but when a shifting link is used the lead of the slide valve will not be constant; that is, the earlier that the steam is cut off the greater will be the lead. This we shall presently explain. We must also note the fact that when a shifting link is employed the angular advance of the eccentric is found according to the rule given in the twelfth paper, but when the stationary link is used the angular advance of the eccentrics will be less. In American locomotives the shifting link is mostly used, and the stationary link is seldom found; therefore, hereafter we will generally confine our attention to investigation of the shifting link.

From the foregoing the reader may be led to believe that the whole purpose of the link is to take one eccentric out of gear and place the other into gear; and, indeed, the writer believes that when the link was first discovered no one expected to use it for any other purpose. But soon afterwards engineers became aware of the fact that the link could be used for cutting off steam in the cylinder at different parts of the stroke, and

must be the same as that which is shown in dotted lines and whose center is at C. Now if the engine is to rotate at one time in a given direction, and at another time in an opposite direction, or, in other words, if the motion of the engine is at any time to be reversed, then we must have some device by which one eccentric can be moved from its position B to C, or we must have two eccentrics fixed on the axle for each slide valve. The latter method, namely, the use of two eccentrics for each slide valve has been adopted in locomotive engines. At present, and for the sake of simplicity, we will continue the investigation of the link and its motion as used in a valve gear in which no rocker is employed.

When two eccentrics are used for moving one slide valve, as in the case before us, then each eccentric must be set precisely in the same manner as explained in the twelfth paper, that is, the angular advance of each

piece F is called the saddle and is bolted to the link. To the saddle the pin G is forged, and is called the link saddle pin. The shaft H is called the lifting shaft, or the reversing shaft; and the arms I J are called the lifting shaft arms. Near the end of the lifting shaft arm I a pin is fastened. The pin I and the link saddle pin G work freely in a piece K, called the link hanger; this link hanger is simply a connection between the link and the lifting shaft. To the lifting shafting arm J one end of the reach rod is attached, as shown. The other end of the reach rod connects with the reversing lever, which is placed in the cab of the locomotive. The reversing lever is here represented by its center line only; more of this hereafter. It will readily be seen that by moving the reverse lever in the direction as indicated by the arrow 3, the link can be raised to any position desired, and thus the motion of the engine reversed.

that, on account of its simplicity it is particularly well adapted in locomotive engines for this purpose. Hence we may say that the purpose of the link is twofold; first, because with it the motion of the engine can readily be reversed; second, the point of cutting off steam in the cylinder can easily be changed. Thus, for instance, if the link is placed in the position as shown in Fig. 164 it will in nowise affect the point of cutting off steam in the cylinder, that is if the eccentrics are set to cut off steam at $\frac{7}{8}$ of the stroke, and the valve has the proper amount of lap, the link will not change this point of cutting off. Again, when the link is raised up so that the center of the eccentric rod pin C_2 will be in line with the center of the link block, then the motion of the engine will be simply reversed, and, as before, the point of cut-off will not be interfered with. If now, on the other hand, the link is raised a short distance only, so that the center of the link block will be located, say, about midway between the end of the link and the link saddle F, then the travel of the valve will be shortened and the point of cutting off steam in the cylinder will be changed.

DEFINITIONS.

Since the cylinders are placed in front of the locomotive, it follows that when the engine is traveling ahead, the crank must turn in the direction as indicated by the arrow 1; but we have seen that when the crank rotates in this direction the eccentric B must work the valve; therefore the eccentric B is called the forward eccentric, and the rod connected with it is called the forward eccentric rod. The eccentric C is the backward eccentric, and the rod connected with it is called the backward eccentric rod. Again, when the link occupies the position shown in Fig. 164, or when it occupies the other extreme position, that is, when the link is moved up, then the link is said to be in full gear. When the link block stands midway between either one of its extreme positions and the center of the saddle pin, the link is said to be in half gear; and, lastly, when the center of the link block is in line with the center of the saddle pin, the link is said to be in mid gear.

The front stroke of the piston is that described from the front end of the cylinder towards the crank, and the back stroke is that decribed from the back end of the cylinder towards the front.

For the sake of brevity, and according to custom, we shall hereafter call the distance from the center of the eccentric to the center of the eccentric rod pin, the length of the eccentric rod; or, in other words, we shall consider the eccentric and rod to be one piece, and therefore the distance from the center B to B_2, or from C to C_2, Figs. 164 and 165, will be the length of the eccentric rod.

By the term, radius of link, is meant the radius of the arc D D, drawn through the center of the opening of the link.

Making Large Spur Gear Wheels.

By P. S. Dingey.

I once had to make some large gears of different diameter for some water-works machinery. They were $3\frac{1}{2}''$ pitch, $7''$ face. The sketches will serve to illustrate the way they were made. Instead of using a spindle and sweep to strike off a level bed, two straight-edges, A and B, were bedded in the ground and leveled, a third straight-edge being used to strike off the bed on A and B. The hub C was located and weighted. The two arms D E were then placed against the hub, and the segment F against ends of arms, care being taken that the two arms were exactly of equal length, and that the ends fitted nicely against hub and segment. All is ready now to try around and see how the teeth come. Throw a little flour between two or three teeth on each end of segment, after which take up the segment and locate arm E, as indicatted by dotted lines G. Set down segment again, using the marks made by flour as guides; mark two or three more teeth one end, and repeat this until around.

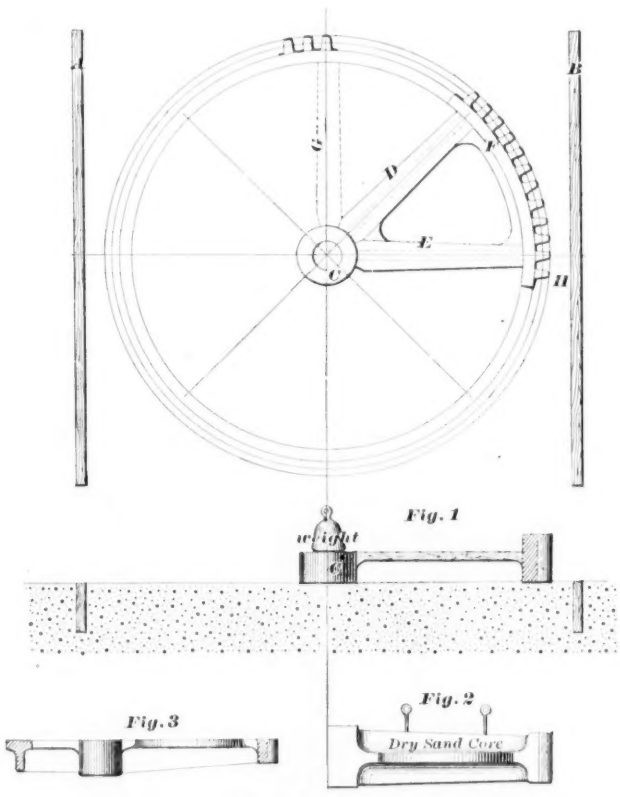
If the last tooth comes a little over the first, as shown at H, nail some thin substance, such as tin, on ends of arms, and try around again; if it comes out all right this time, preserve the marks for setting the segment to in ramming up.

It will be seen at Fig. 2 that the drag side of arms are moulded, while the cope side is formed by dry sand cores. I can recommend this way of making large gears, as I have seen many made so with satisfactory results.

For a gear with narrow face the arms might be cast as shown in Fig. 3, thus doing away with cope cores and covering mould with a plain, straight top.

In making the pattern for segment, do not waste time by dovetailing the teeth on; it is the most costly way, and not at all necessary for coarse pitches. Put in two dowel pins in each tooth, and fasten on with one screw in center from inside of ring. This is just as strong, and cheaper. The practice of putting draft in teeth should be discarded as a bad practice; the moulder that cannot mould a gear that is dead square cannot mould a gear anyhow. Make the teeth without draft, true and square, testing them with a calliper, taking in three teeth at a time. The gears to which I referred were made square, and, though a $7''$ face, moulded and worked very satisfactorily. Reversing gears to compensate for draft in teeth is not as good as making them square across the face.

Another bad practice in the pattern shop is striking the curves of large teeth with compasses—"near enough," some will say; perhaps so for small gears, but for large gears you cannot strike the curves near enough to the epicycloidal or involute curves. Much of the unnecessary friction and jumping of gears is owing to the "near enough" curves of teeth.



Making Large Spur Gear Wheels.

Proposals for Vessels and Machinery for the Navy.

The Secretary of the Navy has advertised for bids for new cruisers and gunboats for the U. S. Navy as described below. Bids will be received up to November 24th.

Proposals are divided into four classes, and may be made under either head as follows:

For the construction of the hull and machinery, including engines, boilers and appurtenances, complete in all respects; for the construction of the hull, complete in all respects; for the construction and erection on board the vessel of engines, boilers and appurtenances, complete in all respects; for the construction of hull according to the plans and specifications approved by the Secretary of the Navy, the constructor to put in engines, boilers and appurtenances of any design which he may consider more suitable than those called for by said plans and specifications, not to exceed, however, in weight, nor in the space to be occupied, that allotted in said plans and specifications, but no such proposal will be considered unless accompanied by full and complete plans and specifications of such proposed engines, boilers and appurtenances and a satisfactory guarantee of the results of the same, if adopted. Every successful bidder will be required, within twenty days after the acceptance of his proposal, to enter into formal contract for the performance of his work, and to give a bond therefor, with sufficient sureties and with a penal sum equal to one-fourth of the amount of his bid.

The three cruisers must be completed within eighteen months and the two gunboats within thirteen months from the execution of the respective contracts.

The department, having in view the construction of two armored vessels of different types, of about 6,000 tons displacement each, also invite the submission of designs from naval or marine architects, from engineers or mechanics of established reputation, all reputable manufacturers of vessels, steam engines, boilers and ordnance; and especially from all naval constructors, steam engineers, and ordnance officers of the navy having experience in such work.

One of the proposed vessels is to be an armored cruiser, and the other as powerful an armored battle ship as can be obtained on the above displacement.

The requirements of the department are laid down in a circular which will be furnished to those interested on application to the department, or to the naval attaches at London or Paris.

The designs submitted will be carefully examined, and one of each type will be selected for purchase, provided it can be obtained at the price mentioned in the circular, and otherwise conforms to its terms. Designers are at liberty to offer any design deemed by them most desirable, whether conforming to the data prepared by the department or not. The designs must, however, conform to the conditions named in the Act of Congress, or they will not be considered. These are as follows:

Two sea-going, double-bottomed, armored vessels of about 8,000 tons displacement, designed for a speed of at least sixteen knots an hour, with engines having all necessary appliances for working under forced draft, to have a complete torpedo outfit and be armed in the most effective manner.

The attention of all steel manufacturers of the United States is invited to the requirements of the Navy Department in the way of armor plates and heavy gun forging, for the prosecution of work authorized by Congress, and they are invited to specify, in competition with each other, upon what terms they will engage to prepare for the production of and produce the forgings and armor plate required for modern ordnance and armored ships.

Bids are invited for supplying the department with about 1,810 tons of steel gun forgings, of which about 326 tons will be for guns of 6 inches caliber, 70 tons for guns of 8 inches caliber, and 912 tons for calibers between 10 inches and 12 inches (both inclusive.)

Also, about 4,200 tons of steel armor plates to be of the best material and manufacture, shaped accurately after patterns to fit the form of each vessel for which intended, and of such sizes as may be required, varying somewhat as follows:

30 feet by 8 feet by 12 inches thick.
$17\frac{1}{2}$ feet by 6 feet by 17 inches thick.
$11\frac{1}{2}$ feet by $4\frac{1}{4}$ feet by 6 inches thick.

There will also be thinner plates. The usual guarantee of good faith and timely performance are required to be submitted with all bids.

We have received a copy of an Anarchist paper called the *Radical*, published in Minnesota. Its aim is to get the Scandinavians to join their crowd, but it will be a failure. The Scandinavians are too thrifty and careful to be led into such company. We make two extracts which show the Anarchist ambition.

"People must learn that it is not hard labor that is needed, but goodness and wisdom!"

* * * *

"Here are a great number of people, men and women, Swedes and others, that do not seem to understand that there is anything more important to do than to work hard, cook, wash, sell whiskey, tobacco and other nasty things, to eat, drink, flirt, dance, marry, speculate, cheat, get money and usury, etc."

It will be seen that a man cannot be steadily industrious and a good Anarchist at the same time.

The recent accident on the Nickel Plate Railroad carries with it an important lesson on the folly of taking chances. A freight train running on the assumption that an excursion train would be behind time crashes into the latter train, killing some seventeen persons. The old adage that "familiarity breeds contempt" was never better exemplified than in this instance. However much the engineer and conductor of the freight train may have been to blame, railroad corporations generally are open to censure in this respect. When an engineer makes his time, no accident occurring, he scores a point without much reference to the risks he takes. Railroad corporations have it in their power to do away with the possibility of occurrences of this kind. But doing this curtails the possibilities of a road to do business. Had this engineer escaped the accident, he would have helped along his reputation. The engineer who "gets there" always stands at the head, till he encounters a catastrophe; then he is, of course, to blame.

Thus writes a New Zealand correspondent of the London *Ironmonger:* "There is no sentiment in business. We should prefer to do business with you, but you must not ask us to take badly finished old-fashioned goods, which, no matter how well they satisfied our fathers, will not do for us. Would you be surprised to hear that no carpenter in New Zealand will use from choice an English hammer, saw, brace, or auger-bit? No buggy-builder will use English coach-bolts or tire bolts if American ones can be had even at 10 per cent. more money than the English, because he can pick up the Yankee bolt and apply it immediately to his work, and with its nice square cut thread there is less chance of nuts coming loose. What is the case with the English bolt? He will look a gross over and find every nut "jammed" so hard on the bolt that it will have to be taken to the vise to be oiled and eased. This takes time, and as time is money he can't be blamed for preferring the Yankee article."

Cranes for Various Purposes.

The engravings represent four forms of cranes built by the Yale & Towne Manufacturing Company, Stamford, Conn.

It will be seen from the design of the power walking crane that it is essentially a jib crane mounted upon wheels, running on a single rail on the ground, and supported and guided overhead by an I beam, which is held in a horizontal position by brackets from above. Bolted to the base of the crane is a cast-iron column, which keeps the mast of the crane vertical when the jib is parallel with the track. When the jib is swung at right angles to the latter, roller guides on each side of the I beam, held in a suitable frame, press against the flanges of the I beam, and the crane can thus be moved readily from one position to another.

Power is transmitted by an overhead flying rope to a vertical shaft in the center of the mast, and by suitable gearing the load can be raised and lowered, carried back and forth on the jib, and the entire crane propelled readily from one end of the building to the other.

On many accounts this is a very convenient style of crane. It can replace a number of stationary hand jib cranes, and can serve a large number of tools in a machine shop. It combines the economy of a crane operated by power, where much heavy handling is done, with the advantages of a traveling crane in its ability to transport the loads through the shop.

It is especially recommended for shops which are somewhat too low for an overhead traveling crane, or where the use of the latter is prevented by posts supporting the roof of the building.

Several foundries, in which pneumatic moulding machines have lately been introduced, have felt that a large saving in the cost of labor would be effected by utilizing a part of the compressed air, which is available in a simple form of pneumatic lift, to enable the flasks to be handled at any point in the foundry. To carry out this purpose, the light traveling crane shown has been specially designed.

The bridge of this crane consists of an I beam mounted upon truck wheels at its ends, and is usually provided with the Weston squaring ropes when the span is over 12 or 15 feet, to make the bridge run true upon the longitudinal tracks.

Above the end of bridge is suspended a reel upon which the hose carrying the compressed air to the pneumatic lift is wound. Connection is made through the axle of this reel with a wrought-iron pipe extending the length of the bridge. At the center of the bridge this pipe is provided with a coupling to which one end of a flexible hose is attached; the other end being connected with the pneumatic lift, which is supported from a trolley running on the bridge as shown in the illustration. A balancing rope is attached at one end to the wall of the foundry and at the other to the reel on the traveling crane. The object of this arrangement is to cause the hose and rope alternately to wind the reel one way or the other as the crane approaches or leaves the pneumatic moulding machine.

It is usual to place the reel end of the crane at the side of the foundry, so that a light shelf may be attached to the wall to support the hose as it uncoils from the reel. The pneumatic lift is provided with a lever, or simply a three-way valve, controlling the air supply by means of which a flask weighing about half a ton can easily be raised and held suspended from the crane. By simply shoving the load it is then moved rapidly to any position in the foundry bounded by the longitudinal tracks.

This crane occupies no floor space, and in those foundries using pneumatic moulding machines has proved itself a valuable adjunct. The economy of labor in handling the flasks in the foundry by means of cranes of this kind is about in the same proportion as the use pneumatic moulding machines is able to effect over hand work.

The Light gantry crane consists of an I beam, used as a bridge, which is supported at both ends by wooden frames or trestles, mounted upon wheels. Two longitudinal tracks are laid upon the ground and the entire strtucture can be moved endwise upon the latter. The load is suspended from a four-wheeled trolley running on the lower flange of the I beam and can be moved across the bridge by a chain wheel and chain operated at one end of the bridge.

The hoisting is accomplished by a winch bolted to one of the frames of the crane, as shown in the illustration.

The hoisting and trolley travel mechanism is sometimes omitted, and simply a differential pulley block supported from the four-wheeled trolley used. The motion across the bridge is then obtained by simply shoving the suspended load.

The gantry, being entirely self-contained, is especially adapted to out-door use, such as building stone walls, laying pipes, handling machinery and in general is a contractor's crane. It can also be used in shops where the framing of the building would not support a jib or a traveling crane.

The power derrick crane is applicable to a large variety of purposes. The mast is supported by guy-ropes, and is constructed of two iron latticed girders 51 feet in height. The jib is composed of two channel beams, with an effective radius of 50 feet. Power is brought by a shaft underground to the foot of the mast, and drives a vertical shaft in the center of the latter continuously in one direction.

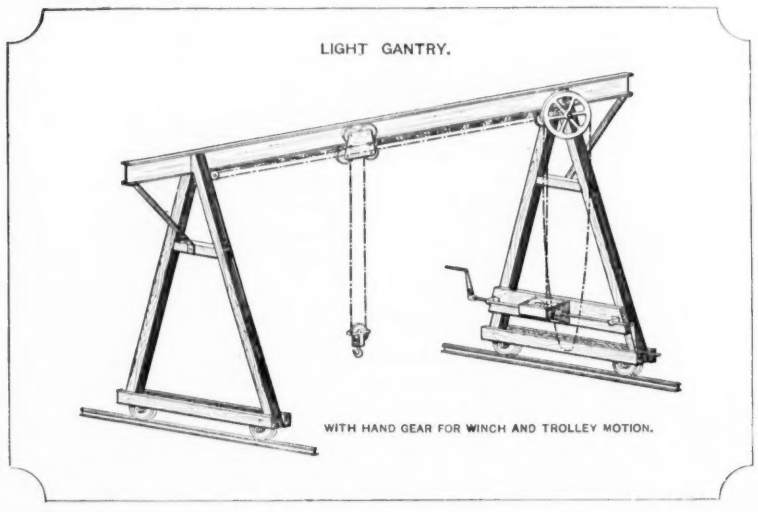
By suitable gearing and clutches the load can be hoisted, the trolley traveled in and out on the jib, and the entire crane rotated at two speeds The load is also under control of a powerful strap brake.

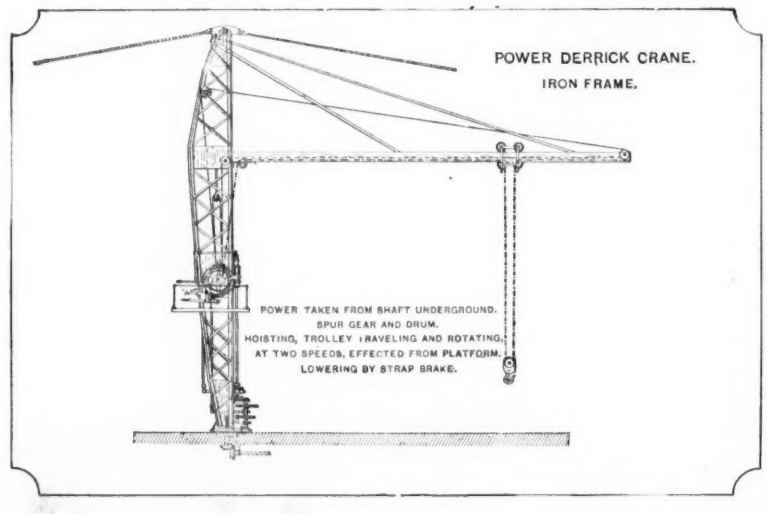
A feature of this crane is the method employed to avoid injurious strains to the gearing in stopping the rotation of the crane.

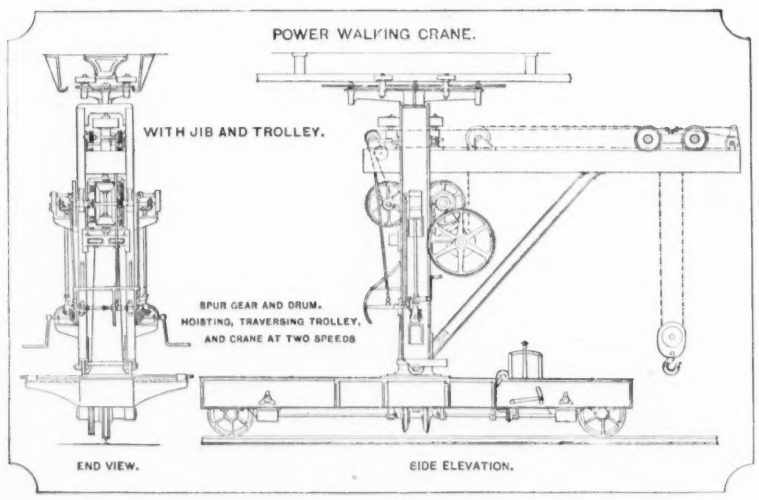
The entire weight of the mast rests upon the turned face of a large gear wheel, which engages with a pinion to which the power to rotate the crane one way or the other is applied. In arresting the rotation of the crane, if the momentum developed by the crane and its load is greater than the frictional resistance of the gear wheel to turning on its seat, the latter is free to slide until this resistance brings the crane to rest.

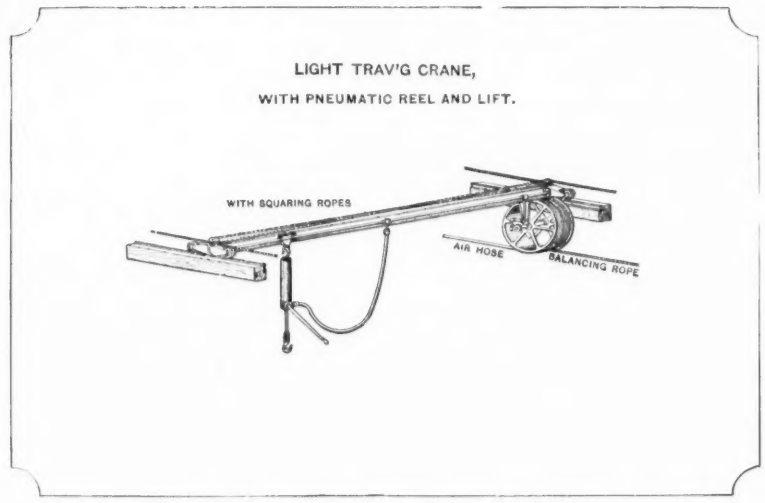
In this way at no time is the gearing overstrained, and the wear of the parts is placed where it can be well provided for.

By substituting suitable frames in place of the guy ropes, this crane is also adapted to handling freight from ships, and also for stone yards and quarries.




POWER DERRICK CRANE.
IRON FRAME.
POWER TAKEN FROM SHAFT UNDERGROUND.
SPUR GEAR AND DRUM.
HOISTING, TROLLEY TRAVELING AND ROTATING,
AT TWO SPEEDS, EFFECTED FROM PLATFORM.
LOWERING BY STRAP BRAKE.





"Speaking of inventions," says the Grand Rapids *Telegram Herald*, "the ordinary gas meter is perhaps the most remarkable and most profitable device ever constructed. So very sensitive is it that the least reduction in the price of gas sets it into much increased activity, and the lower the price, the greater the activity of the meter; and it has been known, when the family was away on a summer vacation, to reman alone at home, and keep industriously at work all the time."

Fifth Annual Convention of the National Association of Stationary Engineers.

Although in years a young society, having been as a national organization in working condition only three years, the convention which closed its session in Boston September 10 stamps it as one of the important factors in future industrial and social progress. The delegates assembled in Boston were the representatives of an intelligent, industrious body of men, associated together for mutual improvement, and to mutually assist each other. As representing such a body, these delegates were fully entitled to the courtesy shown them.

One of the pleasing occasions was that of the reception tendered the delegates at the Quincy House. Mayor O'Brien was present, and made an address full of telling points, which were received with hearty applause. J. M. Allen and others also acquitted themselves most creditably in the matter of brief and pertinent addresses.

The report of Secretary Minor showed a gratifying condition of growth. Twenty-eight new associations have been added during the past year, making 116 associations in working order, with an active membership of about 4,000 and an honorary membership of 648. The secretary's report also showed that there had during the year been 273 lectures delivered before subordinate associations, and 1,416 books added to the libraries. The amount paid in sick benefits was $1,875. This, we think, is a very good showing for a society so young as this.

Business necessary for the continuance of the association was transacted, and important matters relating to its future welfare and progress discussed, and placed in the hands of appropriate committees.

The officers for the coming year are: President, Frank A. Foster, of New Haven, Conn.; vice-president, R. O. Smith, of New York city; secretary, Geo. G. Minor, of Cincinnati, Ohio; treasurer, Geo. M. Barker, of Nashville, Tenn.; conductor, Milo G. Walbridge, of Chicago, Ill.; doorkeeper, Harry Knowlton, of Detroit, Mich. The convention adjourned to meet at Cincinnati, Ohio, on the first Tuesday in September, 1887.

It is said that less work was done on the Clyde during the month of August than in any corresponding month for sixteen years. Shipbuilding in Britain appears to have been fairly overdone, and the business is likely to be slow for some time. In this country, on the Delaware, there appears to be more than the average number of vessels under construction and contracted for.

Walker's Tool-Holder.

Every mechanic knows the advantage of twist and straight flute drills as boring tools, and the thousands of times that such drills have been held in lathes by dogs and temporary arrangements, and how often the dogs, etc., have slipped and broken the drill, and did other damage to the provocation of the mechanic and loss of the employer. This tool-holder was invented after one of these accidents occurred, and from that time there have been no drills broken in the same shop in that way. To use drills in lathes as regular boring tools is now an accomplished fact, with all the ease and feeling of any of the old-style boring tools, without their attendant expense, or without having two kinds of boring tools to keep on hand. Reamers, or any other kind of tools, can be fitted to the socket, which is the same as the Morse standard. In starting a drill, it is only necessary to put the drill point to the work and the butt end of a tool in the rest to touch the drill, same as in square centering, when the drill will readily find the center. Where a large quantity of work of the same kind has to be done, a steady rest, with bushes with holes for several size drills, is very desirable. The tool-holder is very convenient for drilling and reaming holes by hand, where it can pass around, instead of a ratchet. It is also convenient to ream holes by hand under drill presses, or in other machines, before removing the work. Special holders are made with double handles when required for reaming, etc.

The manufacturers of this device are the Walker Manufacturing Company, Cleveland, Ohio.

New Surface Grinding Machine.

This machine is adapted for grinding and finishing hardened dies and punches, and parts of machinery requiring true surfaces. The spindle and boxes are in a slide, which carries the wheel across the work; the wheel cutting in this way, it is claimed, doing more accurate work than when cutting with the face.

The length of the stroke is adjusted by a crank. The machine has automatic feed, and feeds in either direction.

Using an 8″ wheel, a piece 6″ high, 6″ wide and 12″ long, can be ground.

This machine is useful in shops where dies and punches are used, as they can be sharpened better by using a machine than in any other way. It is also a good tool to have in any machine shop for truing hardened pieces. The machine is made by Woodward & Rogers, Hartford, Conn.

A signal torpedo is being introduced on the Austrian railroads which presents some curious points. Instead of being placed in position, it is shot backward by a spring, being attached to a sort of carriage which enables it to slide along the rail, but does not allow it to fall off. By regulating the action of the spring the torpedo can be sent any required distance up to three hundred yards. All the rear brakeman has to do is to place the torpedo slide on the rail, and give the spring the necessary impulse for putting it exactly where he wants it to stop. It is so arranged that he does not even have to leave the car in order to do it; the signals can thus be given while the train is still in motion. The whole apparatus weighs about half a pound; it rises less than $\frac{1}{4}$ in. above the level of the rail. Of course, a special form of torpedo is required for each particular style of rail. The inventor has also made arrangements by which a whistle may be attached to these torpedoes, in order that the watchmen, etc., along the line may be informed of the sending of these signals. It is operated by a rubber bag full of compressed air, which is fastened to the torpedo, and moves with it. We are disposed to think that the inventor has not gone far enough. The torpedo ought also to exhibit a red flag, and leave a long trail of grease behind it on both rails, so as to render the further advance of the coming train impossible. We should also recommend that it be fitted with an arc lamp for use at night, and a telephone, by which the driver of the advancing train could be put in communication with the standing train.—*The Engineer.*

Walker's Tool Holder.

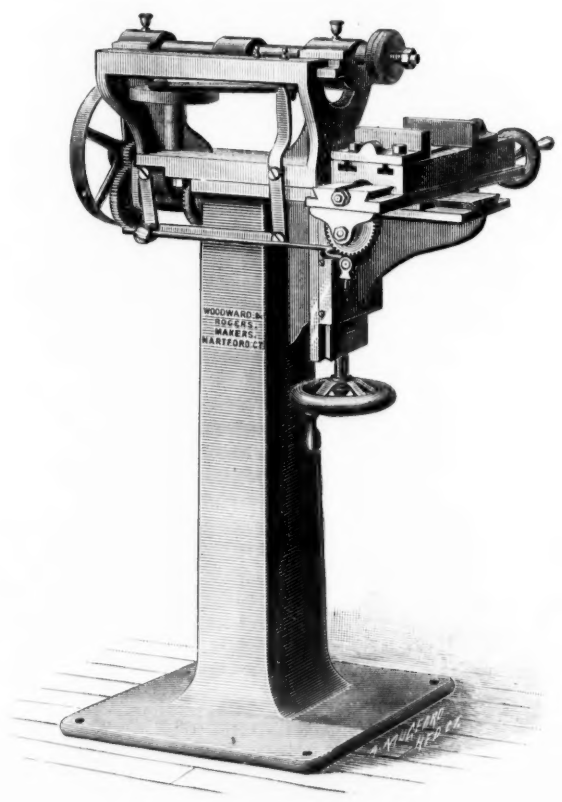
The Tredegar Iron Works, Richmond, Va.

We take the following account of these somewhat famous works from the advance sheets of a work entitled "The Industries of Richmond," now in preparation by the Metropolitan Publishing Company of that city. We are indebted to Geo. W. Englehardt, manager of this company, for the advance sheets:

"Fifty years ago this business was founded by the late Francis B. Deane, but it remained to the last quarter of a century of its existence to make for it a reputation second to no iron industry in America, and this it achieved during the days of the Confederacy, from 1861 to 1865. Prior to this period, however, its locomotives were running on Southern railroads, its rails and spikes were in general use, and the blasts from the steam-whistles of its portable and stationary engines were sounded on two continents. Its propelling power was also felt on the high seas, for the United States steam frigates, Roanoke and Colorado, were furnished with engines, boilers and guns from this great establishment. The Tredegar was also among the first to build a steam launch, the United States Revenue Cutter James K. Polk had her machinery built by, and was fitted out at the Tredegar ship-yard. But, as previously stated, its name and fame is linked with the war history of Richmond, and is as enduring as the city itself. When communication was cut off, and Richmond was wrapped as it were with a blanket by the hosts of opponents without, when munitions of war were almost as necessary as food, then it was that the Tredegar proved a friend in need and a friend indeed. Without going further into detail, it is only necessary to say that this establishment again commenced to manufacture cannon, cannon-balls, and other munitions of war, with which they supplied the Confederate Government until the city was evacuated.

"Many years prior to the war period, the Tredegar Company made cannon for the Federal Government, and as far back as 1846 they were in a trial contest with four other foundries in this class of work, and the United States Government decided in favor of the superiority of the Tredegar. It is not improbable that during the late war between the States, the cannon from this establishment belched forth fire on opposing sides.

"In 1841, which was five years after the Tredegar was founded, General Joseph R. Anderson began to conduct the business, and has been its master spirit ever since. In 1867 it was incorporated, as now, with a capital stock of $1,000,000.



Surface Grinding Machine.

"The capacity of the rolling mills is from 35,000 to 40,000 tons, and 25,000 tons at the four foundries per annum, of such iron as is used in the construction of large steamships, the latter being under the supervision of Robert E. Masters, well known to the iron world as a contributor to the American Machinist on foundry practice.

"The works cover an area of sixteen acres, and are among the largest in the United States. All the vast machinery is driven by water-power from the James River, the capacity of which is equal to 1,000 horse-power. The works give employment to from 900 to 1,800 men, according to the state of trade, and when running in full blast the pay-roll averages $50,000 per month. The product of the works consist chiefly of spikes, fish-plates, bolts, bar iron, horse and mule shoes, water and gas pipe, iron and brass castings generally, stationary, portable and marine engines and boilers, freight cars, wheels, axles, and indeed all kinds of railroad work. Their trade is all over the United States, and in South America and Cuba.

Vanderbilt University, Nashville, Tenn.

We have received the following from John Ashford, engineer at the above named institution:

The above institution opens on the 15th of September with the brightest prospects of any year since it was founded. Changes and improvements have been made from year to year, until it stands to-day the largest and best equipped university south of the Ohio River. The board of trust, at its last annual meeting, made the engineering department a branch by itself, with Prof. Olin H. Landreth, Dean. In the civil engineering branch he is assisted by Prof. C. L. Thornburg, C. E. Ph.D., a graduate of this institution, and in the mechanical engineering department by C. O'C. Acker (Assistant Engineer, U. S. N.) The appliances in the machine shop will be under the charge of John Ashford, an engineer and machinist of reputation, and the carpenter shop under the charge of Prof. Etsler, who thoroughly understands his business.

There is nothing to prevent this from being equal to any institution of its kind in this country. Students from nearly every State and Territory will be in attendance this session. Board on the messing system can be had at about eight to ten dollars per month, and the large extensive grounds of 75 acres, with its beautiful shade trees, etc., makes it one of the most delightful places to be visited. All the public buildings are heated with steam under the most improved system, and no pains or expense is spared to make the students comfortable. Manual technology is free to all comers.

Combustion, Fire-Boxes and Steam Boilers.

ADDRESS OF JOHN A. COLEMAN BEFORE THE AMERICAN MASTER MECHANICS' RAILWAY ASSOCIATION.

After thanking the association for the honor conferred upon him in inviting him to address them, Mr. Coleman said: For many years I was connected with steam engineering. I was with Mr. Joseph Harrison for many years in the introduction of his boilers, and that brought me into connection with manufacturers all over the country. I observed one thing among all these large mills that has struck me also in connection with locomotive engineering—that is, how much we overlook any every-day facts. For instance, we burn coal - that is, we suppose we do—and boilers are put into mills and upon railways, and we suppose that we are burning coal in them when we are only partly doing it. And I wish to make a sort of general statement of what I conceive to be combustion and a boiler, and then to try to make its application to a locomotive. For instance, when we shovel coal on to grates and ignite it, what do we do? We first separate the two constituents of the coal—the carbon from the hydrogen. Carbon won't burn any more than a stone, nor will hydrogen; but it requires so many equivalents of oxygen to mix with so many equivalents of carbon, and so many equivalents of oxygen to mix with so many equivalents of hydrogen, to form that union which we call heat. I presume most of you have read Charles Y. Williams' treatise upon combustion, which was published forty or fifty years ago. In talking with Dr. Seymour once in London upon the subject, he said the poor man had misled the world for years upon this subject, for he covered the chemistry of combustion exactly, but he neglected one very important point. He said: "What is the use of keeping air to put into the furnace? If you take a cubic foot of air, it contains just so many atoms of oxygen, neither more nor less. If you could only freeze the air, condense it, or get more atoms of oxygen into a cubic foot—that is the thing

we want to do." He went on trying that in the large steamships of Great Britain, and he died without knowing why he failed. Where he made close tests, he came out exactly as we all have who have ever attempted to introduce air on top of a fire. The point is this: This process of combustion requires something in addition; it requires heat. When you have raised a cubic foot of gas out of the coal, it is hot, and it is expanded, and it is thin. The cold air that is put in is dense. It is like taking a quart of molasses, with a gallon of water, and tipping those two things together; it takes a good deal of manipulation to cause them to unite. But if you take half a gallon of water first and mix it with half a quart of molasses, then pour the remainder of the water and molasses together, you would get a different result, and in a different time. That was just where Williams failed. I have always maintained that in a furnace you should have the furnace so intensely hot that the instant the air enters it it shall also be expanded like the hot gases, and the thing goes away like a flash, and that is heat. In failing to do that, with the gases of the furnace passing off with a velocity of forty feet a second, the cold air which is condensed is introduced with the hot gases, they strike the flues, and they go fluttering through. The proof of this is easily seen in starting a fire in a common stove when the lining is cold.

You notice the first operation; you produce a mere gas works; there is the blue flame; you can hold your hand in it and it won't burn you. But if you wait until that fire-brick lining gets thoroughly hot, and then put the coal on, and if you then put your hand in you take it out very soon. It is also seen in the gas works. There is the introduction of gas and a certain portion of air; and when you first start off the two elements go fluttering through. They do nothing at all until you have got your furnace thoroughly hot and your retorts thoroughly hot; and then you get the blow-pipe flame. I say, therefore, that all furnaces for making heat should be so constructed that they should present no cool medium around the coal while it is undergoing this process of combustion, so to speak. If you could extend the grate as much as you would reduce it by putting fire-brick all around the locomotive furnace, you would get very much better results than at present, because the effect of this cooling medium around the furnace is like that in an old-fashioned cast-iron stove. You know how quickly the fire will go out around the edges But line the same stove with fire-brick, and there is a totally different result. It would be like putting a thin sheet of ice on a man's stomach after dinner. It interferes with the process of digestion to just the extent of the influence of that ice, because there is a certain amount of heat which is required for this chemical combination that takes place within us and the furnace.

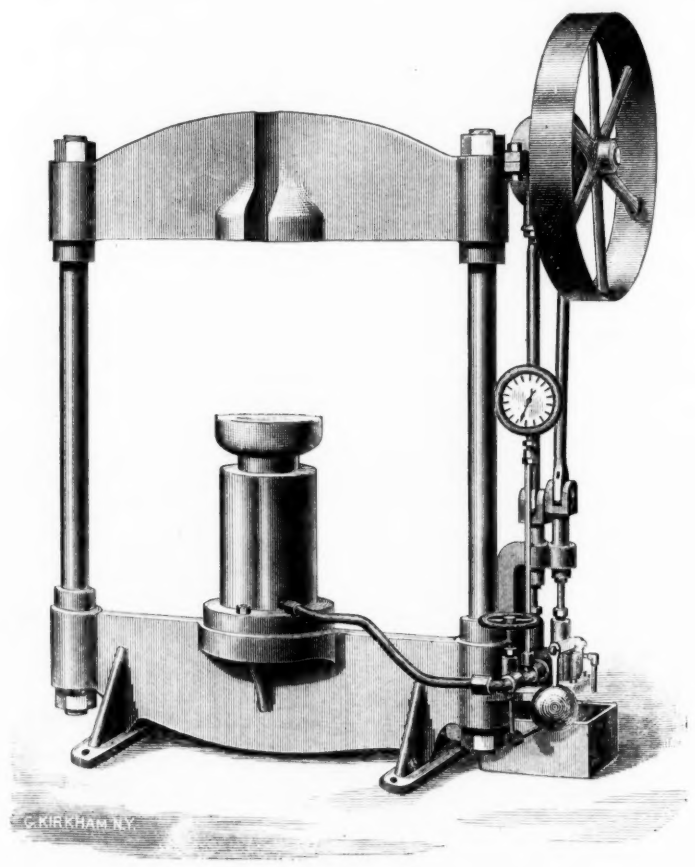
What is a boiler? It is merely a thing to absorb the heat. The bottom of a pot over a fire is the best boiler surface in the world. Now put a cover on the pot, with a pipe extending from it, and you will have a second form of boiler. The next step is the old, plain cylinder boiler, which is a plain, cylindrical pot over a fire. Why don't everybody put them in? Because it is too expensive. That is all there is to the whole subject, as I understand it. We have found in mills, just as I think we should find if we looked at railroads, that everybody is inclined to put in a great deal too small boiler power and too small furnace; and in sugar houses you will see that illustrated, where they will carry 16" fires on their grates. In fact, they force their fires, just as they do on steamships and locomotives. And we have found that as we could persuade mill owners to put in more boilers, and extend the fires so they could burn slowly and give time for this process of combustion to take place in the furnace, because it is a thing that requires time, or else it requires an intensely hot furnace, and even then it requires time, we find that when we can persuade them to do this, we get better results. And in the ordinary locomotive practice, when I find particles of coal hitting me when I am riding in the cars, I do not think that process is properly carried out; and when I see dense volumes of smoke coming from the stack, I do not believe it is carried out; and when I smell the gas that comes up I do not believe it is properly carried out. My point is this: That as we have gone slowly, taken things deliberately in mills, we have saved money. I have in many cases put in large sets of boilers in sugar houses and the like, where we have saved them a thousand tons of coal in a year out of four thousand, and sometimes out of three thousand.

Now, coming to the locomotive. I think if we examine the locomotive carefully it will strike us as a little curious that the best locomotive that I remember reading of in this country weighed about 14 tons. I forget the exact dimensions of its furnace; in fact, I don't think they were given, but judging by the cut I should say the furnace was about two and a half or three feet square. We have gone on increasing the weight of our locomotives until some are as large as fifty tons. We have increased the locomotives over three times, but I will ask you if the furnaces have been increased in proportion? I do not think they have. The furnaces are, some of them are, 6 feet or thereabouts long, and 35 or 36 inches wide, more or less. So that, compared with the old size, you have increased them nothing like in the proportion which you have increased the size of the engine. I had always supposed, as most people who are outside of the railway profession do suppose, that there was something occult and mysterious in railway engineering—that nobody could understand it except those who were bred to the business. Perhaps it is so; and we outsiders may be considered very conceited if we think we know much about it. I think that the position I have taken was fully proven by some experiments that I have already detailed to the New England Railroad Club, that I tried for the Italian Government, during three weeks, in pulling freight trains up grades that were 100 feet to the mile, and it was with an engine that was built by the Reading Road. We took that engine down there, and we scraped the coal dust up in the yards, which they cannot burn at all on their European roads. We had to compete with the best engines on the Continent—the French, the Belgian, and the Austrian engines. We scraped the coal dust up, pressed it into cakes, and got just as good a result with that coal dust as we got from the best coal. We also used five kinds of Italian lignite, which has only half the combustible value of coal. We pulled the heaviest freight trains that they could pack on to us.

We started up this grade, and we found that we could scarcely crawl. Our engineer got very nervous and furious over it. They had already screwed the brake down upon us. We were going slow enough so that he could get off and feel of the wheels. We pulled the train to the top of the hill, but we were blowing off steam furiously all the time that we were drawing that load up. When we got up the station the inspector general came to me and said: "Signor, I congratulate you on having a superb machine here." And I thanked him. One of his engineers came to me and said: "Do you know what you have done, sir? do not tell that I informed you, because, if you do I shall lose my place; you have pulled 50 per cent. more than the maximum load of one of our 40-ton engines." I said to the inspector general: "If you choose to go on with this sort of procedure you can; but you won't get that steam down; that is what you tried to do, to stall us on the grade, and publicly disgrace us."

There was carried out on that machine exactly the proper principles. I won't say it was carried out in a proper manner; the mechanical details may be wrong; they may be improved; there is no doubt of it, because, as you know, one does not always succeed the first time; but the result was that we fired up in a way that I never had seen anything like before in my life. Our fireman used to level up his fires at the station, get everything in readiness, and he was leaning over his tender, smoking his pipe between the stations. Once in a while he pulled the door open, put a shovel full of coal into the hold, and went on. The whole secret of it was, the enormous area of the grate, which, if I remember right, was about seven feet by nine; and we carried a thin fire so that we got just the modicum of air that was necessary for the coal. That is one of the particular points. Of course you will readily see that there is a certain amount of gas in a certain amount of coal, and there is a certain amount of air necessary to burn the coal; and if the air gets through the coal, through the interstices between the coal, and if you keep packing on you will by and by block that passage to such an extent that you won't get air enough. Therefore, we find that with a very fine dust coal, we must run a very thin fire; if we go to chestnut coal, we make a little thicker fire; if we go to stove coal, we may make it six inches thick, and so on; but for ordinary stove coal, or a little larger, we have always found that you should never make a fire over six inches deep if you want to get a good result. The locomotive of the future has got to be changed in some way to keep up with the times. Here is the freight traffic of the country doubling up every ten years. The trains are following each other, one after the other, in rapid succession. What are you going to do? Are you going to double, treble, or quadruple your tracks, or what are you going to do? We are also obliged to constantly economize in the method of conducting this traffic.

It seems to me there are two or three things that have got to be done to the locomotive of the future. We have got to burn a great deal less coal for the steam we make, and after we have made that steam we have got to use it up a good deal more thoroughly. It seems to me that it is obvious that we have, one of these days, got to put in the compound engine which is used to-day in the steamships; and we shall probably get the same results. If we have got steam strong enough to drive another engine, let us put another engine there. A way out of this difficulty about the furnace seemed to me to be shown in an engine which I saw on the Providence and Bristol road the other day, made by the Mason Works of Taunton—that is, the possibility of making an engine upon the idea of a wide fire-box which will overlap the drivers. It was a very ugly looking affair; but "the proof of the pudding is in the eating." Mason, in putting the wheels under the tender, brought his weight upon his drivers; that is, his engine, as I look at it, is with the pivot under the tender. The whole weight of his machine is upon his drivers; and his drivers are far enough ahead, so that he can do as he chooses with his fire-box. If he chooses to spread out wide, he can do it with perfect ease. It seems to me that in these two or three directions it is for you to consider that this matter of combustion must be met; and there is no possible way to meet it except to spread out. You cannot get more by deepening, because you don't have half, nor a quarter, the good that you should obtain from the coal that is burnt now by packing it up in a small area. So that the object of my somewhat rambling remarks would seem to be this: That the locomotive of the future, as it looks to an outsider in various parts of the world, and looking at steam engineering in all its phases, must be changed in the direction of the spreading out of the furnace.



Vertical Wheel Press.

Vertical Wheel Press.

The press herewith illustrated is designed for pressing together composite wheels. The ram is seven inches diameter, and has a movement of eight inches; it gives a pressure of 75 tons.

The upper beam is recessed to permit the suspending chain to place the wheel directly in position for pressing, or for a shaft to pass through. The pump has ¾-inch pistons. Weight of machine, 3,000 lbs.

The manufacturers are Watson & Stillman, New York City.

LETTERS FROM PRACTICAL MEN.

Chips in an Air Pump.

Editor American Machinist:

A few days ago the foreman came along and said: "That air pump you repaired, and was put on to engine No. 55, does not work."

Taking my tools, and going to the engine, on giving the pump steam it would not move, neither would it start by jarring the top-head on the caps; so the caps were started, the head taken off, and on taking out the reversing valve and reversing valve piston they were found all right, and the same with the valve stem.

On looking at the main valve I found some brass chips on top of it, and, on trying to draw it out, it was almost as much as I cared to pull to start it. On getting it out there were fine brass chips jammed in at the sides of the packing. The head was put on with only two bolts, and the air pump throttle valve opened for a short time in order to blow out what chips there might be in the pump. The head was taken off again, and the main valve having been cleaned was put in place, the head was bolted on, and giving the pump steam it started off of itself.

The question was, where did the chips come

from? On inquiry it was found that the pump throttle had leaked badly, the seat being cut. On milling the seat there had been no waste tucked down the dry pipe, so the chips dropped down into the pipe, and not having been blown out with steam before the pump was connected, on opening the steam valve wide open the chips passed with the steam into the pump, causing its failure to work. W. B. Smiley.

Waterville, Me.

Churning Castings.

Editor American Machinist:

Years ago the writer cast a hammer block weighing seven tons, churned about two hours with the usual result—a large hole under riser. The writer has cast an anvil block since, weighing 22 tons; used no feeding rod; result, no hole (visible) in casting.

Close your hand tight; look at it; that is contraction. Now open your fist a little; look now; that is expansion.

That hole in your casting is not contraction; it is expansion

When it is required to draw fluid from the earth, you put down a piston and work it up and down, do you not? And in the face of that fact you put a piston rod in your mould "to churn," which has been said, with a keen sense of the ridiculous, speedily assumes the form and proportions of an ungainly carrot. It becomes a piston, and you, of course, succeed in producing the almost uniform result, namely, a hole; if you don't, it is not your fault. If it is solid, it is altogether accidental. Philo.

Another Steam Donkey.

Editor American Machinist:

The present illustration represents a new "donkey engine" of simple and somewhat unique design. The reader will perceive that it is quite unlike the one illustrated in the American Machinist of April 10.

The body *a* is hollow and receives the exhaust steam, and being closed at each end serves as a heater for the feed water. The cylinder seat *c*, the guide standards *d*, the main box brackets *e*, and the flange for holding pump *b*, are all cast with the body, and are so arranged on the pattern that they may all be planed off, and fitted for the reception of their respective parts; at one clamping upon the planer so that the cylinder *k*, guide and crosshead *o*, and crank shaft and its boxes *m*, will be exactly in working position when bolted on.

The pump is worked from the bottom plate of the crosshead by lever *n*, as clearly shown. The valve system is its chief novelty; it is of the "gridiron" or multi-port type, the same as that illustrated in the American Machinist, vol. 2, Nov. 8. The valve chests *g* are placed upon the ends of the cylinder for the sake of simplicity and easy mechanical construction, and to reduce the space between valves and piston to a minimum. The cylinder is cast double, having a steam space all around it; this space is divided centrally as indicated by dotted lines. The upper half of this space receives the inflowing and the lower half the exhaust steam from whence it passes through the hollow seat *c* to the heater or body *a*, which contains several lengths of the feed pipe. The condensed steam drips into a small tank—not shown—which supplies the pump.

This engine may be placed either end up or horizontal, to suit the purpose for which it is used, and bolted to a timber or other foundation as shown at *f*.

F. G. Woodward.

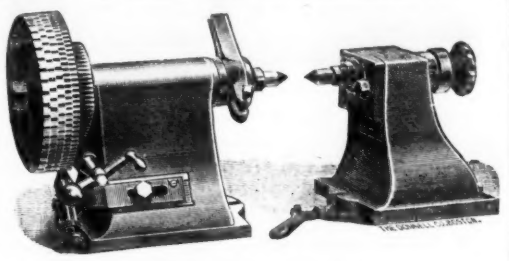
The new brakeman on the way freight was ordered to appear before the oculist to be examined for color blindness. He mistook his directions, and went before the civil service commission. They asked him a few questions about the collection of revenues that made his hair stand on end; then they wanted to know about the value of the American dollar, both silver and real, in all countries of the world; then they questioned him about the commercial relations of the United States and Buenos Ayres, Terra del Fuego, Patagonia, Van Dieman's land and Behring's Straits; and at last, when they submitted a hypothetical case, asking him what he would do in case a consignment of bonded imports, libeled at half *ad valorem*, with non-dutiable drawbacks, returnable in proviso, should be held for seizure under the act of 1879, he grabbed his hat and slid for the door, shouting that he would side-track the consignment at the gravel pit, kill the engine on the main line, throw the exhaust into the ash-pan, and go to the lunatic asylum where he could find somebody who could talk sense. He says it's more than a man's life is worth to run on a road with such a mob of old cranks for directors.—*Burdette in Pathfinder Guide.*

There are 57 wire rod and wire mills in the United States, 27 wire nail works, 85 car works, 76 car axle works, 108 car wheel works, 25 locomotive works, 25 wrought-iron pipe works, and 31 cast-iron pipe works.

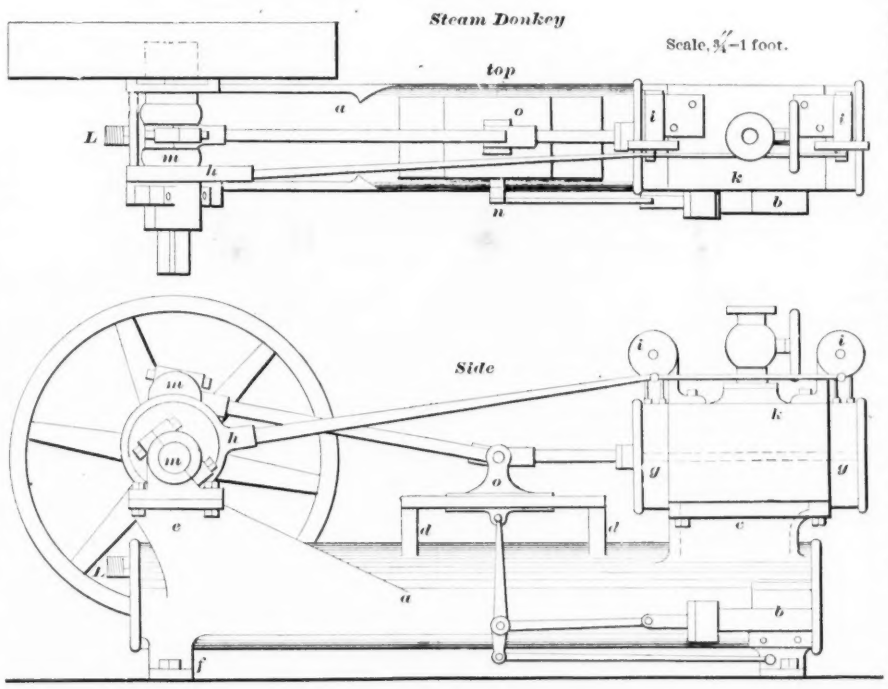
New Planer Centers.

The planer centers herewith illustrated are provided with an improved index, consisting of five circular plates or disks, each $\frac{5}{16}$ inch thick and $7\frac{1}{4}$ inches diameter, which are accurately cut with 44, 52, 56, 90 and 96 notches, respectively, giving a wide range of divisions. These plates are readily taken off and others substituted, with different numbers for special work. The plates, being cut through like a gear, give a much stronger pin than a drilled index. This index is revolved by means of a worm and gear, which are readily disconnected (by loosening one bolt) when not required. Tongues are inserted in bottom of head and tail stocks, and are readily taken out and fitted to the slot in any planer (by planing or filing off of one side), without destroying the alignment.

The spindles, worm and screw, are of steel. The swing is thirteen inches. The makers are Fay & Scott, Dexter, Me.



New Planer Centers.



The Fourth Semi-Annual Convention of the National Electric Light Association was recently held in Detroit. Ralph W. Pope, editor of the *Electrician*, presented his report on Standard Wire Gauges. Efforts to get the wire manufacturers to agree upon a gauge have thus far been unavailing. The report says:

The general tendency on the part of both producers and consumers, who desire accuracy in the filling of orders, is to furnish a sample or specify the diameters in thousandths of an inch, with further stipulations in some cases as to the weight and resistance. This practice will, no doubt, continue, even should a standard gauge come into more general use, while in the present condition of affairs there appears to be no other safe course to pursue. Whatever gauge may eventually be adopted, it must necessarily be based upon actual measurement according to recognized existing standards, and consequently it appears doubtful whether the actual fractions of an inch, which are to conform with a certain number upon a gauge, is a proper subject for legislation.

The wire gauge question could be easily settled if this association, and others of its kind, would follow the example of the Railway Master Mechanics' Association and adopt the Brown & Sharpe Micrometer Calliper as the standard instrument for measuring wire. Its use conforms to the growing practice of ordering wire by decimal fractions of an inch. There is no use in trying to get all the manufacturers to agree upon a notched and numbered gauge, or the buyers of wire to conform to its arbitrary sizes.

No legislation whatever is needed.

Now we are told that the Daft electric motor was removed from the Ninth avenue elevated road because the power required to draw the trains was grossly under-estimated; but it is hard to understand, when the matter of determining the power required could be so easily measured, why this was so. The claims put forth for this motor, when it was first placed on the road, were mysterious. Everybody with a smattering of knowledge of traction and adhesion knew that the weight of the motor was entirely insufficient to move the trains, but the argument was that there was some mysterious electrical influence that increased the adhesion. It turns out that there was gross misapprehension of simple matters that almost any railroad man could have set them right about in ten minutes.

While the tariff "reformers" are laboring to secure any reduction they can, importations are increasing. The Bureau of Statistics find that for seven months up to Aug 1, 1886, our imports of iron and steel and manufactures thereof, not including iron ore, amounted to $24,667,403 as against $17,860,679 for the same period last year. The relative increase in quantity was much greater because there had been considerable decline in prices. If the tariff were reduced materially, we might expect an avalanche of importations and a shutting down of American manufactories.

The *Commercial Advertiser* says:

New uses for petroleum are being discovered almost daily, but the novelty of using it for fuel on a locomotive has been introduced upon the London and Brighton Railway. As yet its use is only an experiment to test the economic and efficient properties of this means of generating steam. Some objections to it have not yet been overcome.

Instead of being a new use for petroleum, this is quite an old one. Experiments with petroleum as fuel for locomotives have been made in this country, notably on the Long Island Railroad in 1882. Where coal is dear and petroleum cheap, as in Russia, for instance, the use of petroleum is a success. With the prices of petroleum and coal as they are in most parts of this country, there is little reason to believe that coal for locomotives will be superseded.

In the British House of Commons there are thirty-five textile manufacturers, all actually engaged in the business, besides a large number of manufacturers of other articles. In our Congress the manufacturers are very few, and the lawyers and bankers many. Members are influenced largely in shaping legislation by the interests of their own business. It would be well for this country if there were a majority of farmers and manufacturers in Congress. Laws specially favorable to their own business would then be a benefit to the whole country.

A correspondent of the *English Mechanic* in discussing the Webb Compound Locomotive says:

"With their enormous first cost, their amazing coal and oil consumption, their peculiar tendency to lose time, and their habitual breakdowns, they have the unenviable reputation of being the most expensive engines running. As an instance of their losing time, I may mention the following amusing incident: "On asking a friend how the compound had done with the 10.15 into Euston, he replied, 'We were 15 minutes late at Warrington, and we have lost time all the way."

* * * * * * *

"It is curious to note that two of our best locomotive superintendents are quite decided agaist compounding—they are Messrs. Stroudley and Stirling. Indeed, Mr. Stirling has said he would as soon think of compounding with his creditors as he would of compounding his engines."

A British Iron Trade Association return of the production of Bessemer steel ingots in the United Kingdom during the half-year ending the 30th June, 1886, compared with that for the corresponding half of the previous year, shows a net increase of make in 1886 of 89,565 tons. The increase in the production of open hearth steel was also very large.

Pittsburgh is going to have an exposition building, a machinery hall and a music hall, that will come up to the highest grade in architectural beauty and general arrangement, judging from illustrations and description in the *American Manufacturer* of that city. They are now scooping out dirt for the foundations. The main exposition building will be 520×120 feet; music hall, 150×180 feet, and machinery hall, 80×100 feet. The building will be constructed of brick, stone and terra cotta.

The bureau of construction and steam engineering at Washington have in hand the specifications for the hulls and machinery of the five war vessels to be constructed. These will be shown to anyone wishing to tender bids.

The free night schools at the Cooper Union will open October 1. Applicants should apply after September 21, on Tuesday, Wednesday, Thursday and Friday evenings.

Among early attempts at invention by Prof. Morse, who invented the telegraph, stimulated by a desire to secure a living, was a new pump, made by him and his younger brother, Sidney, editor and proprietor of the New York *Observer*, to which the latter gave the name of Morse's Patent Metallic Double Headed Ocean Drinker and Deluge Spouter Valve Pump Box.

AMERICAN MACHINIST

PUBLISHED WEEKLY

BY

American Machinist Publishing Co.

HORACE B. MILLER, Pres't.
JACKSON BAILEY, Vice-Pres't.
LYCURGUS B. MOORE, Treas. and Sec'y.
96 Fulton Street, New York.

JACKSON BAILEY, Editor. HORACE B. MILLER, Business Manager.

F. F. HEMENWAY, Mechanical Engineer.

The American News Company,
Publishers' Agents, New York.
The International News Company,
11 BOUVERIE STREET, Fleet Street, LONDON, ENG., will receive subscriptions for the AMERICAN MACHINIST, at 14/7 per annum, postage paid.

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NEW YORK, OCTOBER 2, 1886.

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General Business More Active.

The increased activity in general business is gratifying, and the belief is that it has come to stay. There were unmistakable signs of improvement last summer, and these were naturally followed by a return of business confidence. The iron and steel trades are in better condition than for many months previous, and orders for steam engines, boilers and general machinery are far ahead of what they were. The expression, "trade is quiet, but we are doing very well," has become an old story. It is, perhaps, natural for each man to suppose that he is doing better than his neighbors or rivals in business, but in looking over the whole industrial field it will be seen that the improvement is pretty widely distributed. The earnings of railroads form a good index to the volume of trade. They are much better than a year ago, and seem to go on increasing every week. Crops are good, in spite of droughts, reports of which have been greatly exaggerated. The outlook for fall and winter business is decidedly good.

Prison Contractors Starting New Works.

In noting the fact that John S. Perry, of Albany, New York, will erect extensive stove works at Birmingham, Ala., the *Iron Trade Review* says: "His works have been greatly harassed the past few years by strikes, and this probably has been one of the prime causes of his removal, if removal it be." Mr. Perry's principal works are at Sing Sing, where he contracts for the labor of 900 convicts in the State prison. The contract has run for several years, but the convicts have not struck once. His contract expires next year, and there is no probability of letting any more prison contracts in this State. Is not this reason enough for his starting works elsewhere? Instead of Mr. Perry's being harassed by strikes of workmen, the free stove workmen of this State have been harassed by his having such a force of convicts making stoves at 56 cents a day. No free stove moulders can compete against such wages, even admitting Mr. Perry's declaration that convict moulders produce only 47 per cent. as much as citizen moulders.

There are several other prison manufacturers who will doubtless be looking around for locations of new works before many months. Free workmen will receive a double benefit by the stoppage of prison contracts. More of them will be employed, and the unjust and ruinous prison competition will cease.

Co-operative Stores.

Much has been said and written about co-operation in industrial matters, and some progress has been made in the establishment of manufacturing enterprises upon that plan. But it would seem that the most promising direction in which to look for present results from industrial co-operation is in the way of enabling mechanics to supply the household wants of themselves and families upon that plan, rather than entering upon the broader field of competitive production.

A marked degree of success has attended the starting of co-operative stores in Europe, though the conditions there existing are of course different from those prevailing in this country. Among certain classes long credits are doubtless more in vogue there than here. But it is a fact that some of the most successful mercantile establishments in England are run purely on the co-operative plan, and the attendant benefits are, in many instances, shared by the rich as well as by those to whom it is important to make their scanty earnings go as far as possible.

Buying and selling the strict necessaries of life involves less of complication, and usually requires less capital than would be the case in most manufacturing enterprises. Co-operative stores, too, would be less subject to some of the influences that lend added hazard to many kinds of mercantile business. Workingmen who combine to reduce the cost of their household supplies could afford to disregard many of the considerations which involve expensive methods of doing business, and require elaborate stocks of merchandise to be carried, many of these latter needing constant watchfulness in order to keep up with the demands of an ever-changing fashion. While many of the goods used by the families of workingmen are doubtless now sold at close figures, there are also many other goods on which considerable profits may be saved by the right kind of co-operation. But a careful and wise choice of men and methods must be made, and of course there are localities where the competition of existing large establishments may materially alter the average condition of things.

One or two rules will be found specially worth observing. The par value of the shares should be a sum small enough to be within the reach of all. The whole capital should be paid in cash, and every sale should be for cash, no matter to whom made, and no matter how small its amount. Deviation from this latter rule would certainly result disastrously.

If the workingmen living in almost any manufacturing town would concentrate their now widely scattered purchases into a single co-operative channel, wisely planned and carefully guarded, we do not doubt that great good might be accomplished.

Boiler Explosions.

The subject of boiler explosions continues to be just as strongly agitated as ever, but the results in the way of preventing such casualties are by no means satisfactory. Inquiry as to the cause of boiler explosions is always timely, provided that the whole matter—as is generally the case—does not end with inquiry. There is one direction in which inquiry has never been carried far enough. That is, how many boilers that have exploded in a given period were at the time in charge of competent engineers. We believe that if inquiry was carefully pursued in this direction for no more than one year, a simple means of preventing nine out of ten boiler explosions would be made apparent.

To institute a comparison between the present practice in relation to the care of steam boilers and other things, suppose that in a general machine shop the job in hand—say a general overhauling of a dilapidated steam engine—is given in charge of some man not a machinist? Would any one suppose that the repairs would be made and the engine got running in a satisfactory manner? In thousands of instances a man is put in charge of a boiler who knows as little about the business as the youngest apprentice in a machine shop would know about overhauling a steam engine. Under these circumstances the only wonder is that boiler explosions are not more numerous than they are.

We are not arguing that a boiler has never exploded when in charge of a competent engineer, but if he is not constrained to work against his judgment we think the occurrence of such an event will be found very rare indeed.

So long as the practice is continued of putting men in charge of boilers who have served no apprenticeship, or its equivalent, at the business, it cannot be expected that the number of explosions will be lessened. When this is changed so that a man is expected to know something of the forces he is to control before he is permitted to experiment in that direction, boiler explosions will be practically unknown.

Looking at the operation of locomotives ought to afford a lesson to the users of stationary boilers. The locomotive boiler is generally used with a factor of safety of not much more than half that employed in stationary practice; an enormous quantity of water is evaporated, yet with these drawbacks explosions of such boilers occur very seldom. But the locomotive engineer comes up to his position through a regular apprenticeship as fireman. By the homely process of putting this and that together, a good deal of light ought to be thrown on the subject of boiler explosions.

Engineering illustrates a pair of centrifugal pumping engines, built for a new dock at Newcastle-on-Tyne, which are calculated to discharge 44,000 gallons of water per minute. The pumps are each driven by a vertical engine 20″×18″, fitted with Meyer expansion valves.

Industrial expositions are now running in Louisville, Cincinnati, Chicago, St. Louis and Minneapolis. The expositions must be following the star of empire, for all that is left in the East this year is the old American Institute Fair in this city.

The *Mechanical News* says: "Undoubtedly there is no such thing, in a strictly literal sense, as a paper dollar." Oh, yes, there is. Notwithstanding the stoppage of printing one dollar bills, we get a few of them through the mail quite regularly. They are real, literal, tangible dollars, too, and will pay for as much manuscript and type-setting as any other dollars we can get. Perhaps the millionaire owner of the *Mechanical News* does not recognize anything less than a ten or a five, but the mass of people, who strive carefully to take care of the ones, are not affected that way.

Literary Notes.

DIRECTORY OF THE IRON AND STEEL WORKS of the United States, embracing the blast furnaces, rolling mills, steel works, forges and bloomaries in every state and territory; also lists of wire mills, wire nail works, car-axle works, car-wheel works, carbuilders, locomotive works, wrought-iron pipe works, and cast-iron pipe works. Price, $3. American Iron and Steel Association, Philadelphia.

This is the eighth directory of the Iron and Steel works, the seventh having been issued in 1884. A number of new and valuable features have been added. In the new directory 578 blast furnaces are described as active or likely to become active, which is 97 less than were described in the directory two years ago. As improvements become widely adopted there is less and less likelihood that old furnaces long standing idle will ever be fired up again. But the furnaces in the present list have a capacity of 9,960,000 net tons against 9,300,000 net tons of the former list. The furnaces built in recent years are mostly of large size and modern equipment. The capacity as above stated is that of all the furnaces continuously in blast for a year. As some are idle part of the time the real capacity is much less. We quote from the preface:

"The number of completed rolling mills and steel works described in the directory for 1884 was 434, with 4 building, but in the edition for 1886 only 423 are described, with 13 building. The slightly decreased number of rolling mills and steel works in 1886, notwithstanding the great increase since 1884 in the erection of steel plants, is accounted for partly by the fact that a number of rolling mills which were built to roll iron rails have been wholly abandoned, and partly by the fact that the increasing use of steel tends to diminish the demand for the products of iron rolling mills. These influences are made very apparent in the figures which relate to puddling and heating furnaces. In the edition for 1884 the number of puddling furnaces recorded was 5,265, and of heating furnaces, 2,782. In the present edition the number of puddling furnaces recorded is 4,888, and of heating furnaces, 2,565. The number of trains of rolls has also decreased, the number in the edition for 1884 being 1,555, and in the present edition, 1,475. With the advance of steel the puddling furnace is less and less used, while fewer heating furnaces and trains of rolls are needed.

"The annual capacity of the rolling mills in finished iron and steel is virtually the same now as in 1884, being 7,600,000 net tons in 1884 and 7,613,000 tons in 1886. One explanation is that the increased rolling capacity of the steel works has supplanted the rolling capacity of iron rolling mills. Another explanation is that many of the iron rolling mills which have not yielded to the aggressions of steel have had no inducement in the prices obtained for their products to increase their rolling capacity."

From 1884 to 1886 the number of establishments devoted to the manufacture of cut nails and spikes increased only from 81 to 83. The machines, however, increased from 5,695 to 6,355. Many of the new machines make steel nails.

We quote from the preface again:

"In September, 1884, the country contained 20 standard Bessemer steel works, with 45 converters, and one new plant in course of erection. In August, 1886, when the present edition of the Directory was printed, the number of standard Bessemer steel works was 27, with 58 converters, and 7 new plants in course of erection. These figures indicate a great stride in this important industry in the last two years. This increase has been chiefly in the erection of small plants to make nail plate for steel nails and billets for machinery steel, wire rods, wire, and miscellaneous purposes. Only two works which may roll steel rails as part of their product have been undertaken since September, 1884, and these are not yet in operation. The annnual ingot capacity of the completed and unfinished Bessemer works increased from 2,490,000 net tons in 1884 to 4,102,000 tons in 1886. This increase will attract attention. It is the result partly of the erection of new plants, but chiefly of the improved practice and increased machinery of the old works. All of the Bessemer plants erected in the last two years or now in course of erection are of the standard Bessemer pattern. No basic plant has ever been erected in this country, and we know of none that is now proposed."

There are six Clapp-Griffeth steel works in the country and two in course of erection, as against only one in 1884. The eight works will have 200,000 net tons annual capacity. This steel is largely used for nail plate and wire rods. It is also used for many other purposes where iron was formerly employed.

The open hearth steel works have increased from 35 to 42 in the two years. There are also seven in course of erection. The ingot capacity has increased from 550,000 net tons to 660,000 tons. Those who have not followed the changes in metal manufacture will be surprised to learn that "our crucible cast steel industry is scarcely holding its own in the struggle with steel made by cheaper and more modern methods." In 1884 the country contained 41 works with 3,594 melting pots and an annual capacity 115,000 net tons of ingots. In 1886 (August) we had only 40 works with 3,391 steel melting pots and an annual capacity of 110,000 tons of ingots. We learn that "open hearth steel is the leading rival of crucible steel. Many of our crucible steel manufacturers are adding open hearth furnaces to their crucible plants. For locomotive boilers and fire boxes, locomotive and car springs and agricultural machinery the use of open hearth steel is rapidly growing, but for all the more delicate purposes for which crucible steel has heretofore been used, especially fine springs and fine tools either with or without cutting edges, it will always be in demand."

There has been a decrease in forges that make wrought-iron direct from the ore from 70 to 50 in two years, and the bloomaries have declined from 53 to 42. Cheap steel is interfering with these old methods of making iron.

Speaking of natural gas, the preface says:

"Two years ago not more than six rolling mills and steel works in the United States used natural gas as fuel; now we have a record of 68 rolling mills and steel works which use the new fuel, and of 16 which are making preparations to use it. Every rolling mill and steel works in Allegheny County, Pennsylvania, 55 in all, now uses natural gas. In Western Pennsylvania outside of Allegheny County it is used in 12 mills and steel works; and seven others, including the rolling mill and Gautier departments of the Cambria Iron Works, 79 miles east of Pittsburgh, are preparing to use it. One rolling mill in Ohio is now using it, and eight mills are getting ready to use it. At Wheeling, West Virginia, one mill is making arrangements to introduce it. In all but a very few of the mills and steel works referred to natural gas is used as fuel exclusively."

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials nor location will be published.

(346) F. H., Worcester, Mass., asks: 1. What is the resistance in pounds per square foot of a flat surface forced through the air at a speed of 60 miles per hour? *A.*—This is a matter upon which there is a difference of opinion. A rule derived from one formula is: Multiply the square of the velocity in feet per second by .0022. This would give resistance per square foot at 60 miles per hour about 17 pounds. 2. Is there any difference in resistance between a flat surface six feet square and a cylinder six feet long and six feet in diameter? *A.*—There is reason to believe that there would be a material difference, but there is no available data from which to calculate what it would be. Presumably, the resistance to the cylinder would be less than to the plain flat surface.

(347) Workman, Brooklyn, N. Y., writes: If a mechanic who lives in New York agrees to work in a shop in that city for a stipulated amount, should not his employers pay his traveling expenses when he is obliged to go to Brooklyn to do jobs? *A.*—So far as our experience goes the proprietor always pays traveling expenses under such circumstances as you name.

(348) J. B. U., Dexter, Maine, writes: We have a reservoir in which the head of water varies from 3 to 20 feet. The water is taken from this reservoir by a pump which sets outside the reservoir, level with its base, and elevated to a point 50 feet above the pump. The question is: does the power consumed in working the pump vary with the head of water in the reservoir? *A.*—The power required to elevate the water will vary with the distance from the surface of the water in the reservoir to the surface in the tank or other vessel to which it is elevated, or to the top of pipe.

(349) G. M., ——, asks: 1. How can I lay out two eccentrics for a small marine engine, the eccentrics being cast together? *A.*—If you will read the articles by J. G. A. Meyer, in the American Machinist of October 10 and 24, 1885, and September 4 and 27, 1886, we think you will understand the matter. 2. In what issue of the American Machinist can I find anything about putting up shafting? *A.*—November 1, 1879. 3 I am a machinist and want to learn mechanical drawing; would you advise me to attend an evening school, like the Cooper Institute, or get a situation in a draughtsman's office. *A.*—If you are able to lose the time and can get a situation with a draughtsman we should say that would be the better way.

Business Specials

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

Patent Att'y, H. W. T. Jenner, Washington, D. C.

J. Clayton, Air Compressors, Rock Drills, 43 Dey st, NY

Edw. Sears, Wood Engraver, 169 William st., N.Y.

Steel Name Stamps, etc. J. B. Roney, Lynn, Mass.

Korting Exhaust Steam Condenser. Send for descriptive catalogue K. A. Aller, 109 Liberty st., N.Y.

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

Light articles built to order by the American Sewing Machine Co., Philadelphia, Pa.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts., New York.

20", 25," 28" B.G. and S. F. upright drills for immediate delivery. Currier & Snyder, Worcester, Mass.

The best wire nail and tack and nail machinery. Wm. A. Sweetser, Brockton, Mass.

20,000 addresses of steam users and users of mach. in 10 States, $10. J.N. Mills Pub. Co., 30 Vesey st., N.Y.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 93 John st., N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocum & Son's Shafting Works, Drinker st., Philadelphia, Pa.

Engine Lathes, Hand Lathes, and other fine tools, Assortment large; prices low. Frasse & Co., 62 Chatham st., N. Y.

For Best Return Steam Traps, Pressure Regulators, Positive-Acting Pump Govs., Back-Pressure Valves. T. Kieley, 11 W. 13th st., N.Y. Send for des'n.

Machinists' supplies, brass goods, m'f'rs supplies, polishing materials, all kinds wire, metals, etc; in any quantity. Jordan & Gottfried, 208 Canal st., N.Y.

St. John Improved Self-adjusting Cylinder Packing, for marine and stationary engines and locomotives; applicable to water, air, oil and ammonia pumps. For durability and minimum of friction, it is unexcelled. Send for pamphlet. Address, Balance Valve and Piston Packing Co., room 58, 280 Broadway, New York.

Patent Binders for the American Machinist, holding a complete volume (52 issues), simple, neat, durable. Price $1, prepaid, to any part of the United States by mail. To Canada or foreign countries the price will be 75c.; purchasers pay express charges and customs duties. Am. Machinist Pub'g Co., 96 Fulton st., N. Y.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator, and making all required calculations from the diagram; also the principles of economy in operating steam engines, and current practice in testing engines and boilers. Price, $2 post-paid. Published by John Wiley & Sons, 15, Astor Place, New York

Manufactures.

There are prospects of a cotton factory being erected at Jackson, Miss.

It is stated that arrangements are being made to erect a large cotton mill at Denison, Texas.

The Acme White Lead Co. of Detroit, will build a three-story factory 50x100 feet, to cost $9,000.

The Hemenway Silk works, of Watertown, Conn., are erecting a four-story factory 40x50 feet.

The Mile End Thread Co., Newark, N. J., will erect another large factory at Kearney.

The Domestic Sewing Machine Co., of Newark, N. J., will erect a large new factory.

The Livermore Foundry and Machine Co., Memphis Tenn., have recently enlarged their works.

The Shenandoah Machine Co., Sharon Pa., will build an addition to their machine shop.

The Crystal Shear Co., Southington, Conn., are building an addition to their foundry.

The Allentown (Pa.) Foundry and Machine Co., with a capital of $154,000, has been incorporated.

W. C. Wolfe, of Johnstown, Pa., is fitting up a building at Wilmore for a branch machine and repair shop and planing mill.

The Lansing Iron & Engine Works, Lansing, Mich., is compelled to build further additions on account of growing business.

Einwechter & Sons, 2019 Wishart street, Philadelphia, will erect a two-story factory above York street, 44x102 feet.

A. M. McGregory, lately reported as to start a plow factory at Mobile, Ala., will, with Mr. O. Guinn, start a factory at Moss Point, Miss.

Jones & Laughlins, of Pittsburgh, Pa., will rebuild their foundry, which was recently destroyed by fire. The building will be fire-proof, 210x104 feet.

The Pullman Car Co. have purchased the Dure Mfg. Co.'s works at Wilmington, Del., and will make this their Eastern branch, employing 600 men.

Charles Hudson, of Ansonia, Conn., is to go to Orlando, Fla., in the employ of the Southern Florida Machine Company located there, the stockholders of which are mostly Ansonia people.

M. Raon, Whitewater, Wis., intends to move his foundry and mower workers to Delavan. He has bought the pump foundry at that place, and will erect an addition to be used as a machine shop.

Ernest C. Barth is erecting a machine shop 100x35 feet, at Atlanta, Ga. It will be equipped with first-class tools and in the spring a foundry will be built. Among other things he will build the McKinley engine.

It is stated that in addition to the two buildings lately purchased by the Edison Machine Co., in Schenectady, N. Y., two more buildings will be built. The four buildings will accommodate 1,200 machinists.

A syndicate of iron manufacturers in the central part of Pennsylvania are making arrangements for the construction of a large iron furnace at Pulaski, Va., on the line of the Norfolk & Western railroad.

At no time in the past two years has there been as great activity among the rolling mills of the Mahoning Valley as at present, all having orders in abundance, though prices still remain low.—*Iron Trade Review.*

The capital stock of the Alabama Iron Works, chartered at Birmingham, to manufacture the Van Pelt Pump, is $50,000. A site has been bought and work on necessary buildings will soon be commenced.

We learn that E. P. Allis & Co., of Milwaukee, are doing a brisk business in introducing Gray's patent double scalping machines. Since the capture of Geronimo and his braves there is not likely to be so much demand for it in New Mexico.

The change in superintendents at the Western Steel Company, St. Louis, Mo., has resulted in an increased output and improvement in quality of product. The works are making a very steady run and have orders months ahead.—*Midland Industrial Gazette.*

Albert G. Schieher, late with Wm. Munzer, has opened a machine shop at No. 9 Elizabeth street, New York. He will do general jobbing, paying particular attention to steam engine repairs. He will also contract to furnish plants, and do steam fitting.

The Woodward Iron Co., Wheeling, Ala., in connection with Pittsburgh capitalists, are preparing to erect extensive pipe works with a daily capacity of 200 tons, near their furnace. The machinery is being purchased and work will commence in a few days. 400 men will be employed at the start.

Lodge, Davis & Co., of Cincinnati, manufacturers of machinists' and brass workers' tools, are to commence the erection of a new three-story corrugated iron building, on the property adjoining their present works. It is to be used for warerooms and offices. The building will be 35x95 feet.

The new steel plant being erected by Jennings, Beale & Co., at Leechburg, Pa., is almost completed. Seven furnaces have been erected, with a complete set of rolls. It is thought the works will be in operation about the 1st of October. Two hundred men will be given employment.

The Capital City Street Railway Co., Montgomery, Ala., previously reported as deciding to run all their cars by electricity, will erect a two-story brick building, 70x100 feet, for their plant. They are negotiating for two 150 horse-power engines and rails for three miles of additional track.—*Baltimore Manufacturers' Record.*

The Shultz Belting Co., of St. Louis, are in receipt of an order from Copenhagen, Denmark, for 3,000 ft. of leather belting, part of which will be shown at the exposition in Denmark. A feature of the company's remarkably active trade this year are telegraphic orders, which are received every day from all parts of the country.—*Age of Steel.*

It is stated that the works for the Anglo-Pacific Steel Co., soon to be built at San Francisco, Cal., will include a wharf 62 feet broad, 100 feet into the bay; cranes, furnaces, steam hammers, forges, and all other apparatus needed for a first-class plant are to be provided, and the works are to cover the widest range, from horseshoe nails to armor-plates and crank-shafts for ocean steamers.

A. L. Ide & Son, Springfield, Ill., have issued "Catalogue C" of the Ide engine, dated September, 1886. The illustrations are profuse, and with the descriptive matter make all the parts of this engine and its working intelligible. They are built from 12 to 1,000 horse-power, and it is said over 200 of them are in use. They are also built by the Harrisburg Foundry and Machine Co., Harrisburg, Pa.

Carnegie Bros. & Co. and Miller, Metcalf & Parkin, of Pittsburgh, are about to form a building and loan association for the benefit of their employes. A tract of land is to be secured on which the workmen will erect houses, the employers to furnish the capital. In this way the men will secure their own homes on easy payments. The purchase of a tract of land at $50,000, on which 100 houses are to be built, has been considered.

The Skinner Engine Co., of Erie, Pa., have issued a new illustrated pamphlet of their engines which have been built and sold for the last nineteen years. There are hundreds of them in use throughout the United States, and they are known in Central and South America. A line of single and double "Titan" engines has lately been completed. A telegraphic code and numbered parts of the engine are published in the pamphlet.

The Gilkerson Machine Works, Homer, N. Y., write us that their business is fairly good, much better than any year since they began business three years ago, and there is a prospect of plenty of work, the coming winter. Their planer vises are sold by the principal machinery dealers throughout the country. They have just received a set of standard end measures of length from J. Whitworth & Co., Manchester, which will be used in connection with their 24" measuring machine.

The *National Labor Tribune*, of Pittsburgh, in its weekly review of local industries September 11, says: "The outlook in our mills is still more cheering, but we cannot see how the volume can be much greater than it is now. There are each day over 1,600 tons of muck iron made, which is all used as fast as it is turned out, besides over 200 tons a day used in the works here that is made in other mills. In one of the tube works orders were given to work eight-hour turns. That throws the men into 16 hours' work out of 24. How long they can hold out at that remains to be seen. The orders for wrought iron pipes in every mill in this country are so numerous that it is impossible to fill them inside of the next year.

A new method of making screws was invented a few years ago by Mr. Charles Fairbairn, of Manchester, England. Instead of cutting a groove round a bar of iron to form a thread, the thread is rolled by displacement or flow of the metal under heavy rollers. A machine invented for the operation does the work of screw forming. A series of rollers which may be two, three or four, according to the kind of thread required, have grooves cut in their peripheries corresponding in shape and pitch to the threads wanted. A bar of iron or steel passed through these rollers, has a beautifully formed thread pressed out of the surface of the metal. All sorts of screws are made by this process, from the heavy press screw 4" in diameter to small ¼" wood screws. The process leaves a screw much stronger than when the thread is cut, and bolts cut in this way are said to be coming into popularity for all purposes where threads are subjected to heavy strain or hard usage. The machines are made by Fairbairn & Wells, who have opened an office in the Commercial Bank Building, Chicago. We understand the patent rights to the process in this country are for sale.

Machinists' Supplies and Iron.

NEW YORK, Sept. 16, 1886.

There is nothing worthy of note in the way of change in manufacturing or in the supply business.

Iron—While there is no special demand for pig iron the market remains firm, with no inclination to shade prices. Sales are steady and regular at prices affording some profit to furnacemen. We quote Standard brands, No. 1 X Foundry, $18 to $18.50; No. 2 X, $17 to $17.50; Grey Forge, $16 to $16.50.

Scotch Pig—There is but little in stock, and prices are held firm at: Coltness, $20; Glengarnock, $19; Gartsherrie, $19.50; Summerlee, $19.50; Eglinton $17.50 to $18; Langloan, $19.50.

Lead—The market is quiet; asking price for Western 4.70c., with few buyers.

Copper—Lake, 10.45c. to 10.50c.

Antimony—Hallett's, 7.70c.; Cookson's, 9c.

Spelter—Refined, 5¾c. to 6c.

✻WANTED✻

"Situation and Help" Advertisements only inserted under this head. Rate, 30 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Machinists, send address to L. S., AM. MACHINIST.

A first-class machinery salesman is open for engagement. Address B. B., AM. MACHINIST.

Foundry foreman of 20 years' experience wants a position; highest references as to ability, etc. Address Box 3, AM. MACHINIST.

Wanted—Experiment work by skillful mechanic with tools and brains. Expert, AM. MACHINIST.

Wanted–Skillful machinist and instrument maker, with systematic ideas, fine and rapid workman on tools, wants position; high testimonials; two years' references from late employers. Box 7, AM. MACH.

An experienced draftsman and designer on steam engines and general machinery would like to change position. Address Experience, AM. MACH.

Wanted—3 or 4 first-class machinists; steady work; good wages; only competent men wanted. Address Enterprise Electric Co., Friendship, N. Y.

A young man desires situation as pattern-maker: accustomed to cocks and valves and small work. Address F. C. Jung, 59 Lafayette ave., Br'kl'n, N.Y.

Wanted—A young man, qualified by practical shop experience, desires engagement in vicinity of N. Y. City, as superintendent or head draftsman, where light, first-class machine work is done. Box 66, AM. MACHINIST.

Manufacturers or others desiring supt. of machinery and repairs, or mechanical supt., address as below; is first-class mechanic in all branches, draftsman, etc.; large experience in steam and water power, millwright work, shafting, gearing, mill work, building, erection of machinery, repairs, etc.; posted in machine, boiler, pattern and foundry work; has occupied similar positions; is accustomed to handling men; salary reasonable. Address H. A. C., AM. MACHINIST.

✢ MISCELLANEOUS WANTS. ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion.

Crescent steel tube scrapers are unquestionably the best. Crescent Mfg. Co., Cleveland, Ohio.

Crescent boiler tube cutter, for setting new and removing old tubes. Crescent Mfg. Co., Cleveland, O.

Steel stamps, stencils, burning brands, and brass checks. T. M. Parker, Hartford, Conn.

Light mach'y of all kinds built at short notice. Edmund Mills, 8 Dey st., Jersey City Heights, N. J.

For Sale—Small machine shop and foundry; well located; full or half interest. S. & H., AM. MACH.

Xperimental work for inventors; fine work; low price. LeRoy & Sharpe, 96 1st st., Br'kl'n, E.D., N.Y.

For Sale—Whitcomb planer, 8'×27"×27", good as new, one 10' lathe 18" swing; planer patterns for 6'×24"×24', and special tools. Woodman & Weare, Laconia, N. H.

Machinery—Sept. list sent on application; new & 2d-hand engines, lathes, planers, shapers, drills. C. L. Jackson & Co., Mach'ry, Tools & Supplies, Balto., Md.

The best engines and boilers, ½ to 4 H.P.; economical in price, steam, etc. Washburn Engine Co., Medina, Ohio.

John Lamborty, mfr. telegraph and electrical instruments, experimental machs, models; fine gear cutting a specialty. 35 S. 5th st., Br'kl'n, E.D., N.Y.

Special tools and machines for mfg. designed and built to order; mechanical and Patent Office drawings. Weston & Smith, Syracuse, N. Y.

Send for estimates of high-speed compound enginss for stationary and marine service. Crist Engine Works, 140 Baxter street, N. Y.

Experimental and new machinery for special purposes built by contract from specifications and inventors' designs; ample facilities. Cohoes Iron Foundry and Machine Co., Cohoes, N. Y.

I will invest $5,000 in any legitimate line of light manufacturing that will bear strict investigation. Address "Practical Mechanic," care AM. MACHINIST.

Wanted—A first-class cotton and woolen shuttle maker as partner; a good opportunity for a man (who understands the business) with a small capital. Address Box 4, AM. MACHINIST.

✢ MISCELLANEOUS WANTS. ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion.

For Sale—The machinery, tools, plating apparatus and raw material of manufacturing establishment; now working on orders in brass and other metals; very low rent, including steam power. Address Manfr., P.O. Box, 285, New Brunswick, N.J.

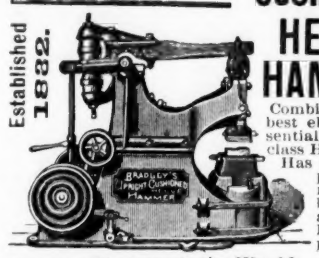
Wanted—Latest improved second-hand 25" Hendey shaper with down feed; state time in use, condition of wear, shop number and price, with cost of delivery in Pittsburgh. Address Box 257, Pittsburgh, Pa.

For Sale—A well established foundry and machine shop, including lots, buildings, machinery, patterns, and stock on hand, situated in Logan, Hocking Co., Ohio; will sell on easy and satisfactory terms; reason for selling—old age and ill health. Apply to R. Belt, Logan, Ohio.

For Sale—A first-class foundry and machine shop; large connection in saw-mill county in the South, including buildings, lots, machinery, and will supply stock on hand; business will be carried on until sold; reason for selling, retiring from business; apply at or address Southern Foundry, AM. MACHINIST.

BRADLEY'S UPRIGHT CUSHIONED HELVE HAMMER

Established 1832.



Combines all the best elements essential in a first-class Hammer. Has more good points, does more and better work and costs less for repairs than any other **Hammer** in the **World.**

BRADLEY & CO. Syracuse, N.Y.

Business Opportunity.

TO LEASE or FOR SALE. Machine shop and foundry paying large profits. Shops Leadville, Colo. Address,

A. FALKENAU,
Care of DICKSON MFG. CO.
SCRANTON, PA.

PATENTEES and others desiring specialties manufactured, will find unequalled facilities and low estimates by applying to THE JEWEL MFG. CO., Toledo, Ohio

BEAUDRY'S UPRIGHT CUSHIONED POWER HAMMER

The success of our Machine is the best guarantee of its value. Only machine with Double Helve. Does more and better work with less repairs than any other.

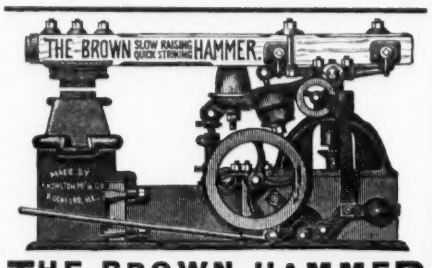
BEAUDRY & CUNNINGHAM, Boston, Mass.

STEPHENS PATENT VISES.

A 50 Per Cent. of time and labor saved by using this solid, strong, durable, quick-working Vise. Has the Improved Taper, Pipe and other attachments. Sold by the trade. Send for circular

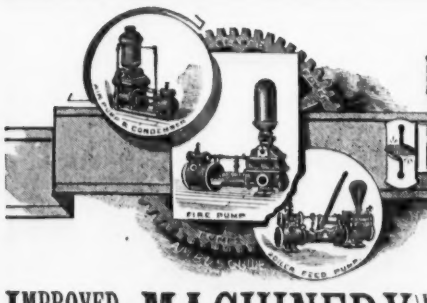
MELVIN STEPHENS, Prop'r.
Office, 41 Dey Street, New York.

THE BROWN HAMMER



STRIKES A BLOW WITH
Double the Velocity That it Raises the Hammer.
A NEW MOVEMENT! SEND FOR DESCRIPTION.
Knowlton Mfg. Co., King St., Rockford, Ill.

KNOWLES Steam Pump Works.

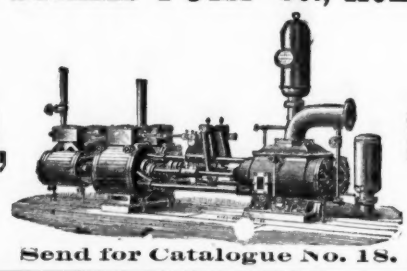


93 Liberty St. NEW YORK. | 44 Washington St. BOSTON.

IMPROVED PUMPING MACHINERY For Every Class of Work | SEND FOR NEW ILLUSTRATED CATALOGUE.

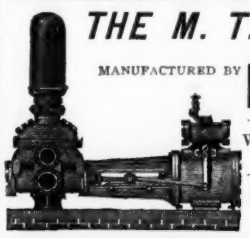
THE DEANE STEAM PUMP CO., HOLYOKE, MASS.

BUILD WATER WORKS, ENGINES AND STEAM PUMPING MACHINERY.



Send for Catalogue No. 18.

THE M. T. DAVIDSON IMPROVED STEAM PUMP,



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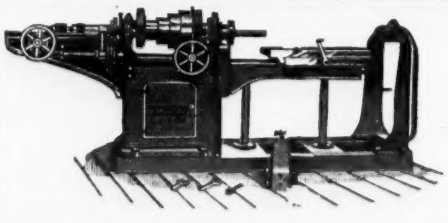

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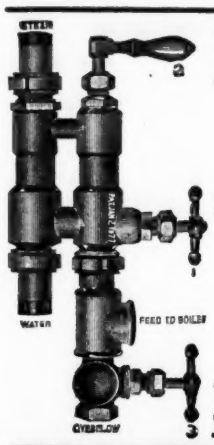

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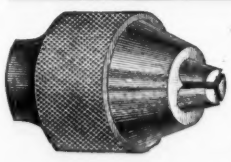

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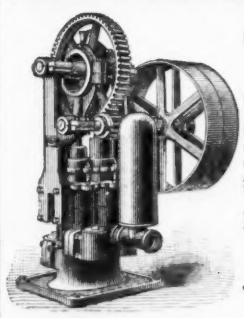

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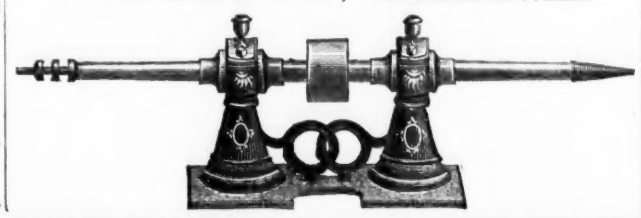

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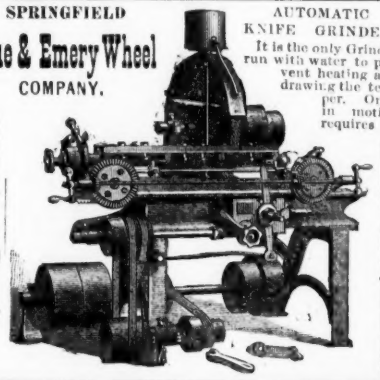

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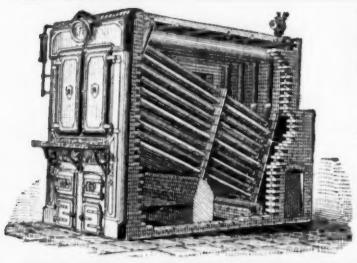

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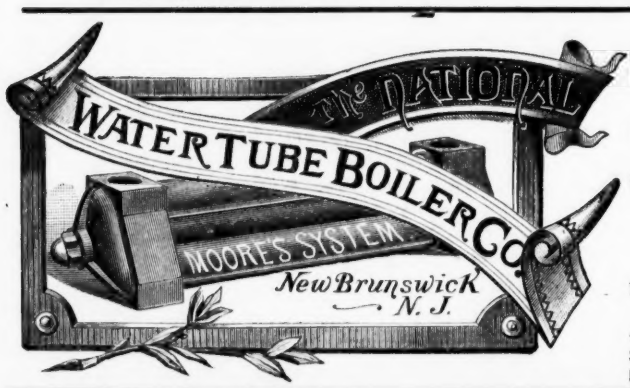

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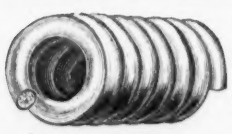

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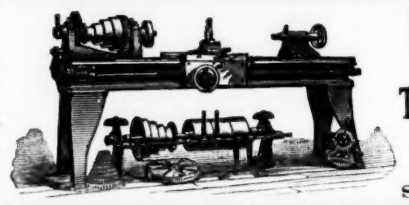

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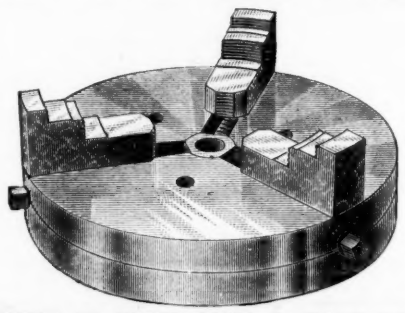

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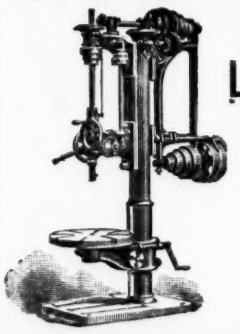

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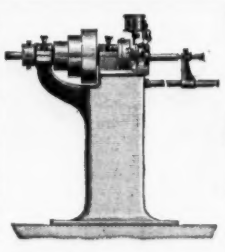

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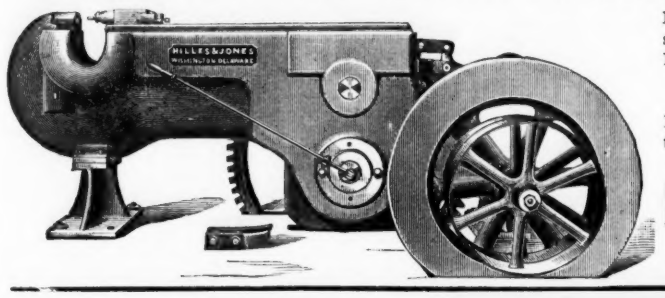

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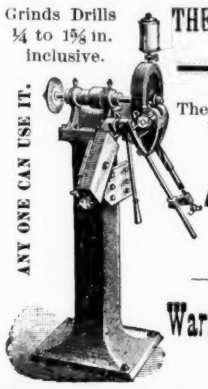

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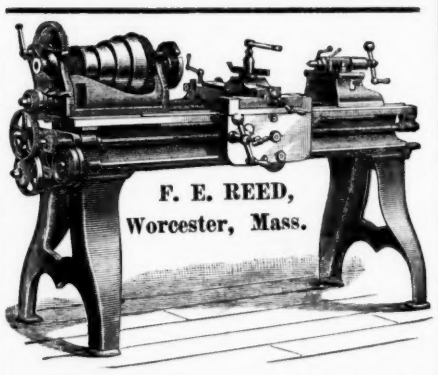

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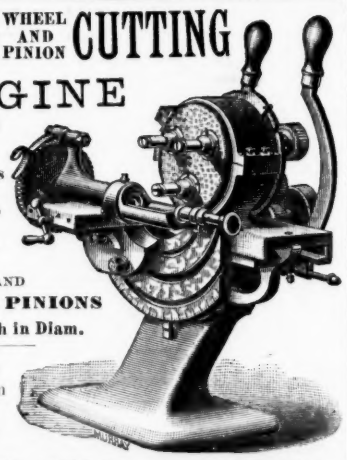

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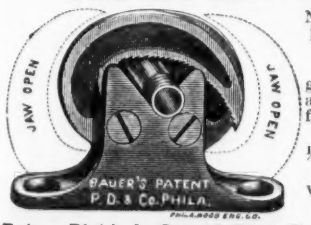

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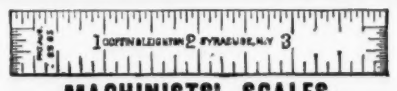

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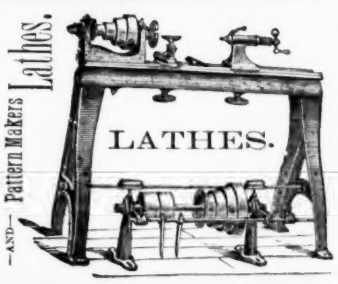

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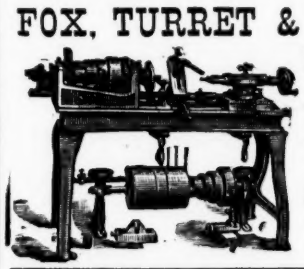

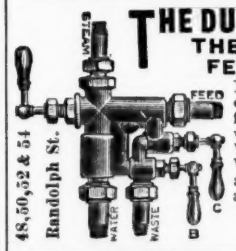

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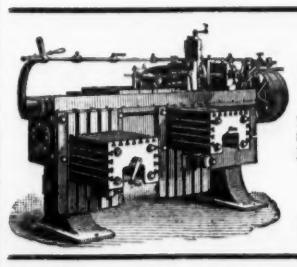

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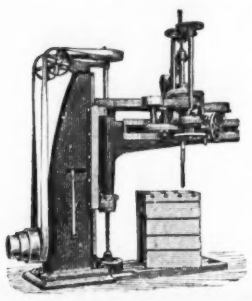

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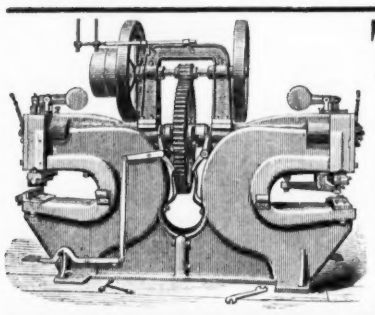

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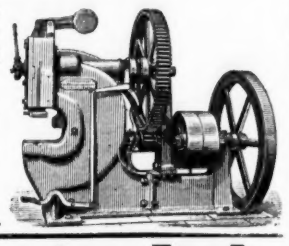

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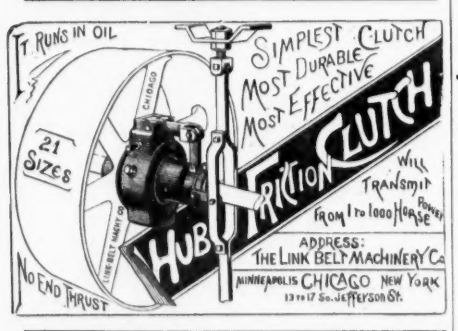

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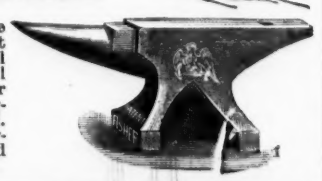

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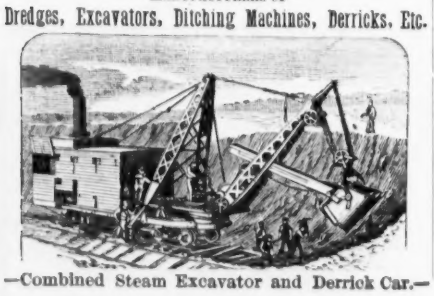

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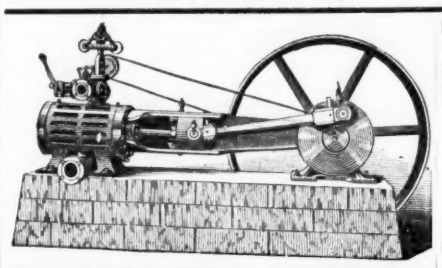

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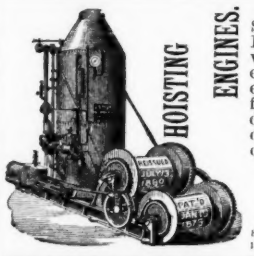

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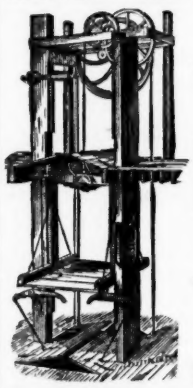

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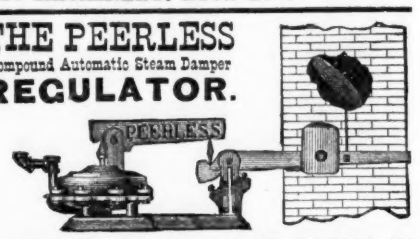

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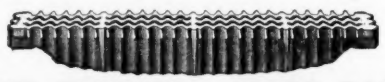

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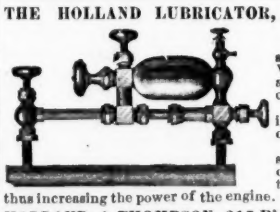

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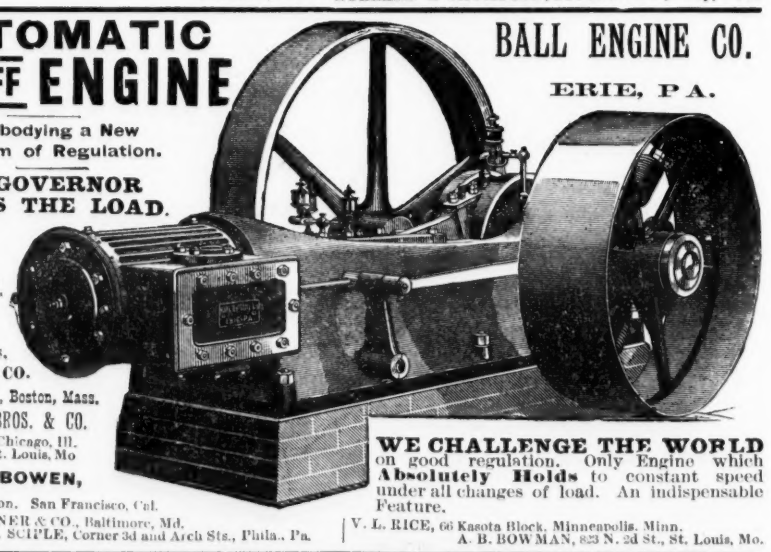

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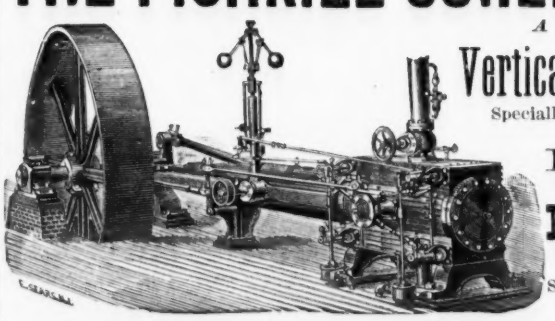

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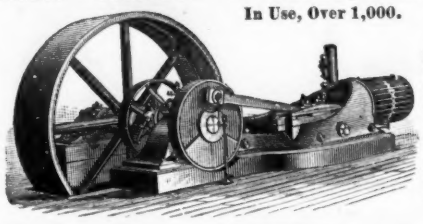

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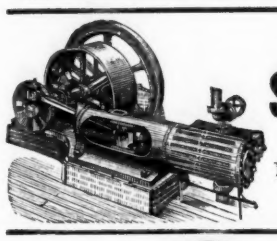

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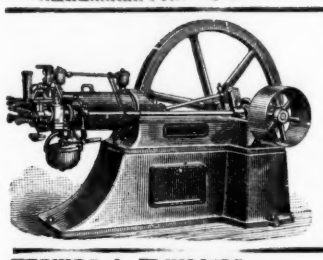

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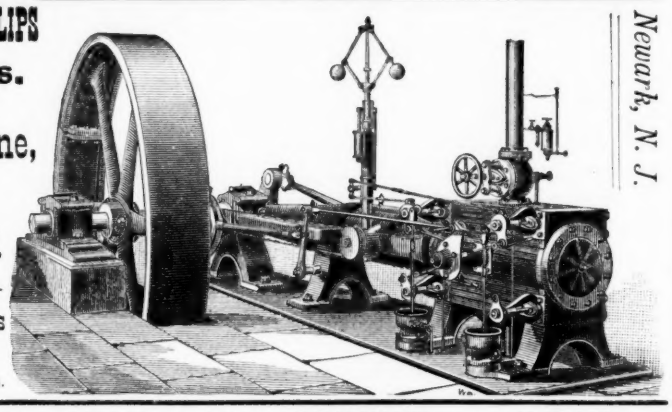

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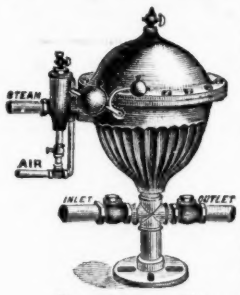

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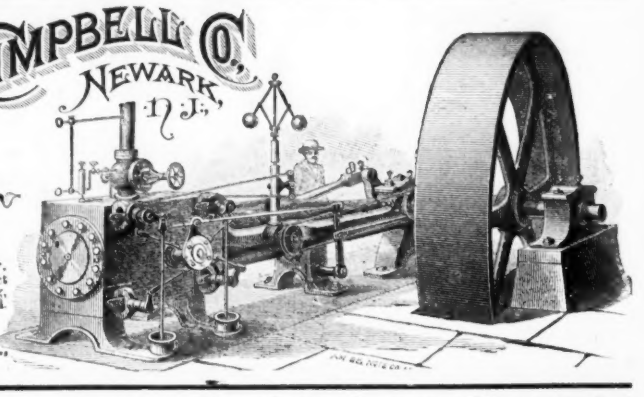

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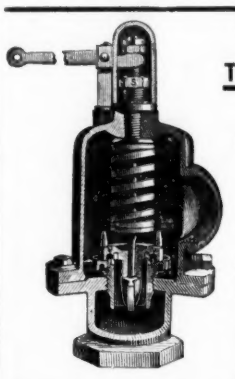

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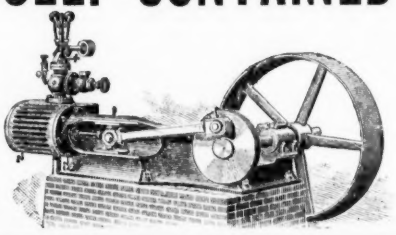

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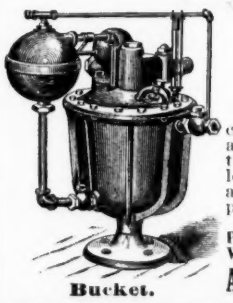

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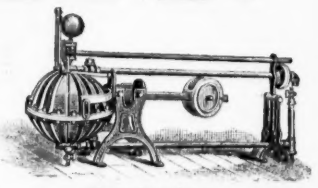

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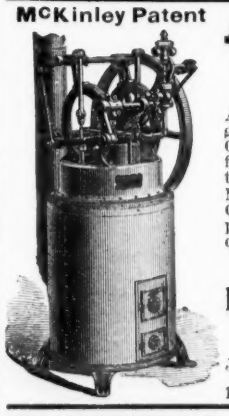

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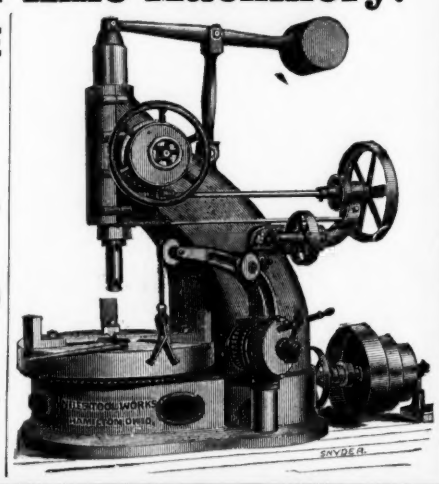

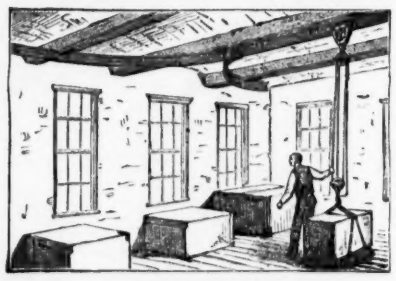

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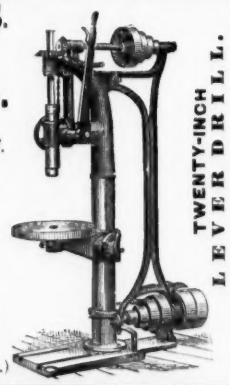

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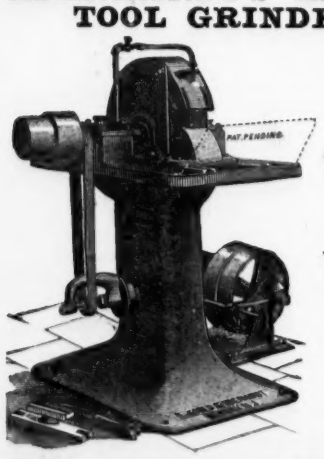

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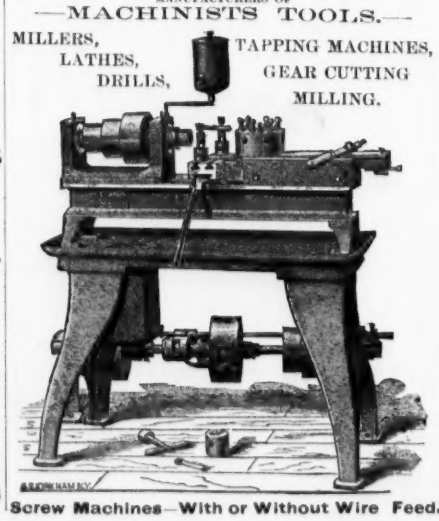

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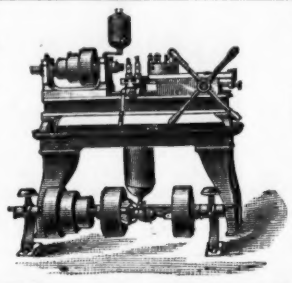

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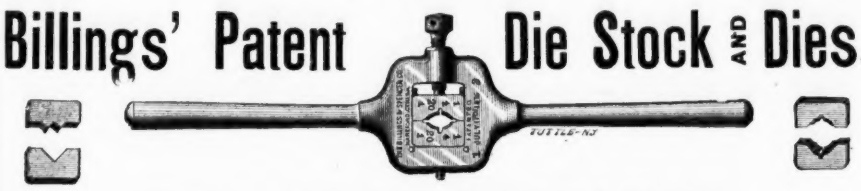

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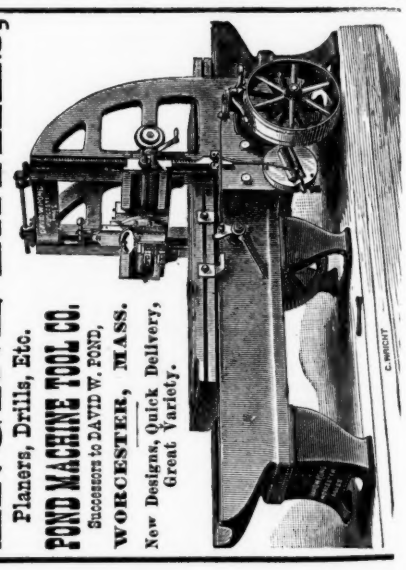

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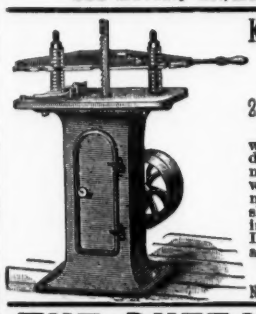

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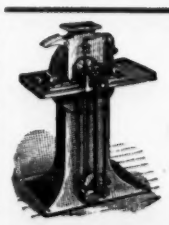

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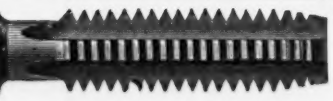

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